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SUMMARY OF RECENT ABSTRACTS***IX. LEPROSY †***Epidemiology*

Up to about 1,000 cases of leprosy are reported each year from Morocco, where SICAULT and ROLLIER (p. 456) found that the incidence rises to over 0·2 per 1,000 in the regions of Casablanca and Fez.

In the Gambia McFADZEAN and McCOURT (p. 902) found the incidence to vary from 1 to 3·9 per cent., rising in the upper reaches of the river. About one-quarter of the cases are lepromatous.

From Uganda BROWN (p. 903) argues that susceptibility to leprosy is inherited, that social structure determines the age of onset, age frequency and disease pattern, and that infection can be spread by persons with tuberculoid disease, though those with lepromatous disease are usually regarded as the infecting agents. He supports this argument by epidemiological observations.

In Uganda (where there may be about 8,000 cases) the people do not tend to live in villages, but in houses widely scattered throughout the country. This mode of life offers a natural barrier to the spread of leprosy but renders a rural medical service difficult. He (p. 904) describes the village settlements which have been created for patients, where they may live and receive adequate treatment and be segregated, but from which they are allowed to return home from time to time.

The incidence of leprosy in India has been estimated at 5·4 per 1,000, and for Western Bengal at 14·7 per 1,000. DHARMENDRA (p. 50) discusses the social aspects of the problem and the methods which could be

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1955, v. 52. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on leprosy in this series see the November issues of the *Tropical Diseases Bulletin* each year since 1939.

expected to control the disease, such as making treatment available to all, and vaccination of children with BCG.

Death rates in patients with lepromatous leprosy in the Philippines were found by GUINTO and his colleagues (p. 653) to be between 2·5 and 7 times as high as in the general population, but there was little difference between the rates for those with non-lepromatous leprosy and for the general population. In part of Cebu Province, Philippines, the incidence of lepromatous leprosy has declined in recent years, but they (p. 1094) found an increase in the non-lepromatous forms, especially in children. This change to the less severe forms suggests a gradual eradication of the disease. LEVAN (p. 51) describes a case of leprosy in an American soldier who served in New Guinea and the Philippines during the war.

A survey of leprosy in Western Samoa and the Cook Islands is reported by SLOAN (p. 456 bis), who notes a low proportion of lepromatous cases and states that the disease appears to have almost entirely disappeared from the northern islands. He made a similar survey of American Samoa.

REYES *et al.* (p. 983) give an account of leprosy in Salvador, Central America.

In Martinique MONTESTRUC *et al.* (p. 646) have found many cases in children under 15. They no longer use chaulmoogra, relying on DDS alone, and they advocate BCG vaccination of newly-born infants, and isolation of children of leprous parents and other measures of isolation of infective persons.

MONTESTRUC (p. 159) gives 4 examples of familial leprosy in which the disease appeared in the children before the parents. He thinks that parents and children may have been infected from another source, at the same time. Two cases are reported by MONTESTRUC and BERDONNEAU (p. 646) of leprosy in infants aged 3 weeks and 2 months respectively.

GAY PRIETO and CONTRERAS (p. 159) give an account of an adult who repeatedly inoculated himself with blood from lepromatous patients but failed to develop leprosy. They think that children acquire the disease more easily than adults, and are more frequently exposed, but there is evidence that infection may be acquired in adult life.

DE SOUZA ARAUJO (p. 273) discusses the finding of acid-fast bacilli in the bodies of various insects, and suggests that the subject of possible transmission of leprosy by insects should be comprehensively investigated.

Aetiology

EMBIL *et al.* (p. 647) failed to induce growth of leprosy bacilli by inoculating them into chick embryos.

LOWY and RIDLEY (p. 51) describe a technique for staining *Mycobacterium leprae* in paraffin sections. The organism is difficult to stain in such sections because it adsorbs paraffin wax and its acid-fastness is destroyed as a result of extraction with fat solvents. Pinene (the active

principle of turpentine) restores acid-fastness if it is in contact with the bacilli at the moment of application of the acid used for differentiation, and this is the basis of the method described.

Myco. marianum was originally isolated in France from a patient with leprosy, and FLOCH (p. 272) set out to decide if it is the true leprosy bacillus. He found that an antigen prepared from this organism, on injection into patients with leprosy of different kinds, gave results which diverged widely from results given with lepromin, and he quotes other work which suggests that the differences were not likely to have been due to the tissue debris present in lepromin, which is not present in the antigen from *Myco. marianum*. He therefore concludes that this organism is not the leprosy bacillus. It can convert some negative Mitsuda reactions from negative to positive, but so can vaccination with BCG and other mycobacteria. Similarly MORETTI (p. 784), after considering the properties of *Myco. marianum*, concludes that it is not the leprosy bacillus, but is a "paratubercle" bacillus.

DE SOUZA ARAUJO (p. 647) cultivated, *in vitro*, acid-fast bacilli from the noses of 2 patients with leprosy; they produced small tumours on injection into rats and mice.

Pathology

SUTER (p. 159) reviews the subject of intracellular parasitism of bacteria, observing that in acute conditions phagocytosis usually results in the destruction of the engulfed organisms, whereas in chronic conditions the engulfing cell may protect the organisms from the action of substances (such, for instance, as streptomycin) in the blood. Moreover, macrophages from animals immunized with BCG, in cultures, can suppress proliferation of tubercle bacilli, but in unimmunized animals virulent bacilli can escape the phagocytes, because of their destructive capacity. In leprosy either the phagocytes become able to inhibit the bacilli, or a higher degree of cellular sensitivity is established which destroys the phagocytes loaded with bacilli, so that these in turn are exposed to unfavourable extracellular environment [see RIDLEY, p. 1302]. HANKS (p. 159) discusses the subject, pointing out that the leprosy bacillus may operate at much lower metabolic levels than the tubercle bacillus, and may therefore prove disappointing in its response to drugs affecting metabolism. In tissue culture experiments fibrocytes from tuberculoid leprosy rapidly reduced *Myco. leprae* to debris, and the cells were damaged and changed into epithelioids. On the other hand fibrocytes from lepromatous leprosy grew normally and were unable to destroy the bacilli.

KHANOLKAR (p. 647) discusses the pathology of leprosy, and makes the point that evidence has been found which strongly indicates that the bacilli travel within the axons of nerves. In examination of the skin in leprosy GASS and BALASUBRAHMANYAN (p. 161) found that most nerve destruction was in the superficial subepithelial layer. Destruction was least in lepromatous disease and most in tuberculoid.

CASILE *et al.* (p. 650) describe a case in which, after amputation of the lower part of the leg for perforating ulcer and intractable pain, advanced leprotic changes were found in the posterior tibial nerve. The condition had not definitely been diagnosed during the patient's long illness.

MUT MUT (p. 162) describes bone lesions in leprosy. The specific lesions are due to direct infection of the bone, but the more common lesions are non-specific, and are due to neurotrophic changes.

In a study of the liver in leprosy BECHELLI (p. 457) found lepromous lesions in 95 per cent. of livers from lepromatous patients, which took the form of lepromatous infiltration round the portal vein branches, lepromatous induration and cirrhosis. The weight was increased in about half the patients. Enlargement was detected in about one-third of a large number of general leprosy patients examined, but in neural cases this was due to other causes than leprosy. Tests indicated that even when there was considerable enlargement there was seldom much interference with function. OKADA (p. 161) found tuberculoid lesions in liver biopsy material from patients with tuberculoid leprosy. Epithelioid cells and surrounding lymphocytes, and giant cells of Langhans type, were seen; all the patients were negative to tuberculin.

CONTRERAS *et al.* (p. 161) describe cases of elastosis, especially in healing lepromatous leprosy when there have been many attacks of lepra reaction, which leave the skin thin and atrophied.

SAGHER *et al.* (p. 273) inoculated leishmanin, milk or peptone into the skin of lepromatous leprosy patients, and allowed a sandfly to bite one. Histological examination of the resulting lesions, and a comparison with those from uninoculated leprosy patients (some with erythema nodosum) showed that there was a specific foam-cell reaction typical of leprosy, indicating that leprosy induces a specific altered reactivity of the skin, whose reaction to injury produces a histological picture characteristic of the host's tissue response. KOCSARD and SAGHER (p. 274) found that the tuberculin reaction was negative in some patients with lepromatous leprosy, and positive in others. The negative test could be converted to positive by BCG. There is no specific anergy to tuberculin in lepromatous leprosy, and the tuberculin test shows the same specificity as in the general population. If BCG is inoculated into the skin of patients with lepromatous leprosy the resulting lesion is characteristic of leprosy, and if into the skin of tuberculin-negative children it is characteristic of tuberculosis. SAGHER *et al.* (p. 274) therefore suggest that BCG vaccination might afford a means of detecting leprosy in early cases, and might be useful in assessing treatment. Similar findings, characteristic of leprosy, on injection of leptomonads of *Leishmania tropica* into the skin of lepromatous patients, were observed by LIBAN *et al.* (p. 785).

Tests

DE FARIA (p. 785) has published a review of experimental studies on the lepromin reaction.

DHARMENDRA *et al.* (p. 649) compared 3 lepromin antigens by injecting them simultaneously into a series of patients. In general the early reactions with the two Dharmendra antigens and the late reactions with the Wade antigen were in agreement; the Wade antigen gave the strongest reactions.

Satisfactory lepromin can be prepared by the usual Mitsuda method from infected lymph nodes rich in leprosy bacilli. BLUM GUTIÉRREZ (p. 274) found that lepromin made from glands which had been preserved in formalin for 2 years gave satisfactory results in the lepromin test. Treatment with sulphones is making it more difficult to obtain material from which Mitsuda antigen can be prepared. To save material DINIZ and NETO (p. 648) therefore use a more dilute antigen than usual for a first test, followed by the normal antigen if the first test is negative.

In a paper on host reactions to the leprosy bacillus LOWE (p. 544) showed that none of the separate fractions of the leprosy bacillus would elicit the late lepromin reaction, but only the whole bacilli. The early reaction (24-48 hours) resembles the tuberculin reaction but the late Mitsuda reaction has no parallel in skin testing in tuberculosis; the only parallel is in histopathology. The early phenomenon indicates sensitivity to the protein; the late reaction indicates resistance to the bacillus. The various serum tests show that in lepromatous leprosy there are circulating antibodies to a component of the tubercle bacillus, but in proportion as these tests are positive the lepromin test is negative. The tissues of tuberculin-positive persons can react to the leprosy bacillus by tubercle formation, and this is a more definite indication of immunity than mere protein sensitivity. In lepromatous leprosy there are abundant circulating antibodies in the blood, but no sensitization and no cellular antibodies are revealed by the lepromin test. In tuberculoid leprosy the few bacilli provoke intense cellular reaction, but circulating antibodies are few. There is some factor (or group of factors) operating in tuberculoid leprosy which is absent or inactivated in lepromatous leprosy, and this absence renders the patient susceptible and the disease progressive.

In French Guiana the form of leprosy in the Europeans is of more severe lepromatous type than among the indigenous Creoles. FLOCH (p. 650) tested lepromatous patients with tuberculin, finding positive results in 40 per cent. of Creoles and 33 per cent. of Europeans, and concludes that a previous mild tuberculous infection gives para-immunity to leprosy, and that BCG vaccination gives a certain amount of resistance to leprosy.

Simultaneous injections of lepromin and tuberculin into patients with leprosy, patients with pulmonary tuberculosis, and healthy controls showed little correlation, and KUPER (p. 786) concludes that there is no simple and direct relationship between sensitivities to the two substances, though a relationship of some kind may exist because some lepromatous patients who had no radiological evidence of tuberculosis showed intense sensitivity to tuberculin.

FERNANDEZ *et al.* (p. 547) show that hydrocortisone injected together with lepromin tends largely to inhibit both the early and the late reaction.

RIDLEY (p. 53) thinks that the leprosy bacillus may establish itself first in the peripheral nerves where the natural defence forces cannot reach it, and multiply until it can invade the open tissues of the skin. He carried out complement-fixation tests with lepromin and tuberculin, finding lepromin (but not tuberculin) complement-fixing antibody in patients with negative lepromin skin reaction, and observing that by incubating together serum from lepromatous patients and lepromin, the power of lepromin to induce skin reactions was abolished. A lepromin reaction may be absent because fixed antibody is absent, or because circulating antibody may neutralize the antigen before it reaches the tissues. DAVEY (p. 904) repeated some of Ridley's work, by incubating lepromin with serum from patients with lepromatous leprosy and from normal persons, but he did not find that the lepromatous serum had any inactivating action on lepromin. Similarly, DHARMENDRA and MUKERJEE (p. 1096) were not able to confirm Ridley's work.

DE SOUZA ARAUJO and LAGÔA (p. 648) show that the serum of leprosy patients contains antibodies capable of fixing complement in the presence of rat leprosy bacilli, with more intensity than with the antigen of Bordet-Ruelens, used in the serological diagnosis of syphilis. Ross (p. 648) found only 44 per cent. of positive results with the Maillard-Gagliardo complement-fixation test in leprosy; in this test the distinctive feature is that the complement is reconstituted, dried, frozen guineapig serum. FLOCH (p. 53) did a number of tests for syphilis on sera from patients with leprosy; with the TPI test as the standard he concludes that in a country where leprosy is endemic the Kahn is the least reliable of the other tests tried, and the Vernes test the most reliable. In a series of patients with leprosy EDMUNDSON *et al.* (p. 1096) found a high proportion (46-63 per cent.) of positive results with various serum tests for syphilis, but only 11 per cent. with the TPI test. The lepromatous form was responsible for more positive results than the tuberculoid form. To improve the specificity of serum tests for syphilis in leprosy patients PORTNOY and EDMUNDSON (p. 545) have used a technique with choline chloride solution. This was found to help in differentiating syphilitic and non-syphilitic sera, and the results compared favourably with those obtained with the TPI test.

A modification of the haemagglutination test was found by Ross (p. 648) to be positive in 91 per cent. with active lepromatous leprosy, 75 per cent. of those with quiescent lepromatous disease, and 70 per cent. of those with tuberculoid leprosy.

Experience with the Hanger, Gross, cadmium and formol-gel tests showed that they were more usually strongly positive in bacteriologically positive, toxic and generalized leprosy than in uncharacteristic and tuberculoid forms, and they were always positive in lepra reaction.

CONTRERAS *et al.* (p. 786) state that these tests give a good idea of blood protein, and as they correspond to the present classification of leprosy they indicate that this has a biochemical basis.

MAUZÉ and ARNAUD (p. 52) have carried out electrophoretic studies of the serum in leprosy and they regard this as an excellent means of determining the response to treatment; the gamma globulin fraction is the most interesting. In similar work MIGUEL *et al.* (p. 52) found the albumin-globulin ratio generally below unity owing to increase in the gamma fraction. Of other tests the erythrocyte sedimentation test was the most in accord with the albumin-globulin ratio. CONTRERAS *et al.* (p. 162) also note the increase in gamma globulins and in total plasma proteins. The proportion of globulin increases particularly during lepra reaction, and gamma globulin especially when there are diffuse hepatic lesions. If there is a diminution of plasma protein, blood or plasma transfusion is very efficacious.

Clinical findings

A general account of ocular leprosy is given by KIRWAN (p. 651) in a paper which embodies long experience and which contains some excellent illustrations. CHOYCE (p. 651) discusses the mode of infection of the eyeball, which he thinks is probably by migration of the bacilli along the ciliary nerves. If the disease is in the quiescent phase, ocular leprosy responds surprisingly well to surgical procedures. In a discussion of lepromatous infiltration is the most serious, and is common even in mild cases, though it may not produce marked symptoms. The response to treatment with sulphones by mouth and cortisone locally may be very good. MANN (p. 546) recommends the use of cortisone and the sulphones in active keratitis and iritis, with atropine in the latter. It seems that treatment with sulphone is also effective against trachoma. LANDAU and GABBAY (p. 1097) report a high incidence of ocular complications in leprosy patients in Jerusalem, and describe them. Chemotherapy was beneficial but toxic side reactions occurred in some cases.

GUNS and LACHAT (p. 984) give an account of the clinical appearance found in the nose, larynx and pharynx of patients with leprosy.

MONTEL (p. 984) describes a case of nodular erythema due to leprosy.

SOUZA CAMPOS and RATH DE SOUZA (p. 649) describe 3 reactive states associated with the tuberculoid form of leprosy, namely tuberculoid reactivation, reactional tuberculoid, and borderline.

Treatment

JOPLING (p. 645) shows that although leprosy is notifiable in Britain there are no statutory powers whereby a patient can be sent to hospital against his will. He gives an account of the Jordan leprosy hospital in

Surrey, to which only patients with lepromatous leprosy are admitted. The bacteriological results of treatment with sulphones are poor [see also BYERS and WOLCOTT, and PALENCE *et al.*, below, p. 1305], though clinical improvement is evident, and isoniazid and thiacetazone have been disappointing. He discusses the difficulties of patients being treated, and the steps taken to overcome them.

At the All India Leprosy Workers' Conference, 1955 (p. 1092), LAKSHMANAN described the formation of treatment units and study units which are expected to make treatment readily available to patients, and which are to play a large part in the control campaign, which will make full use of sulphone therapy. MUKERJEE described plans for BCG vaccination in a controlled investigation of its effect in preventing leprosy, and WARDEKAR spoke of the prophylactic use of DDS in child contacts, and the use of BCG in lepromin-negative child contacts. DHARMENDRA and CHATTERJEE re-examined persons who had been tested with lepromin 15-20 years previously, and found a high incidence of leprosy (especially lepromatous leprosy) in persons originally negative to the test, but a much lower incidence (non-lepromatous forms only being found) in those originally positive. They emphasize the important prognostic value of the lepromin reaction in exposed persons. BRAND described an operation devised for the correction of drop-foot, one of the most distressing disabilities of leprosy.

GRAMBERG (p. 652) describes ambulatory treatment of leprosy in Indonesia, to the effect that the sulphones, even DDS, are too costly. In comment Muir suggests that in the generally accepted weekly dosage of 600-800 mgm. [not gm. as printed in the original abstract] the annual cost of DDS per patient should be within one American dollar. He thinks that larger doses must have been given in Indonesia, since the author remarks on the toxicity of DDS.

A comprehensive clinical evaluation of Diasone, DDS, dihydrostreptomycin and PAS, alone or in combination, was made conjointly in 4 widely separated institutions; the patients were suffering from lepromatous leprosy. DOULL (p. 1097) reports that Diasone, DDS and dihydrostreptomycin were of definite and approximately equal value. Some of the patients became lepromin-positive, and some became bacteriologically negative, including some of the controls who were given a placebo.

BUU-HOÏ (p. 163) discusses the difficulties in the way of selecting drugs for trial in leprosy, one of which is the questionable ethical issue in substituting a drug of unknown effect for one of acknowledged therapeutic efficiency such as DDS. He suggests trial of 2 new drugs, one of which might be useful in sulphone-resistant cases.

NAHAS *et al.* (p. 164) treated patients with various sulphones and observed the relationship between anaemia and blood concentrations of DDS. Concentrations of more than 0·6 mgm. per cent. caused anaemia; those of up to 0·5 mgm. did not alter the picture even on prolonged treatment.

RIST *et al.* (p. 164) discuss the action of a new disubstituted sulphone which has been reported active in leprosy and less toxic than DDS. Its action appears to be due to the amount of DDS liberated from it in the body; this liberation is slow.

In trials of various methods of injecting DDS intramuscularly for long-lasting action MONTESTRUC *et al.* (p. 984) preferred to give a dose of 1.25 gm. of DDS in chaulmoogra esters every 8 days; this provides the best concentration curve, which is the reason for the chaulmoogra rather than any expectation of therapeutic action by it. LAVIRON *et al.* (p. 1098) obtained good results with intramuscular injections of 1.25 gm. DDS in 6 cc. of chaulmoogra esters, given twice each month. They later doubled the dose, and gave this once each month, and again the results were favourable, although the blood concentration fell to nil after the 15th day. They finally reduced the dose to 2 gm. DDS once each month.

FLOCH and GÉLARD (p. 457) sought to maintain adequate blood levels of DDS by injecting intramuscularly a suspension of crystals large enough to be absorbed slowly but small enough to pass through the needle; the crystals, obtained by cooling after heating for sterilization, are isolated by passing through a sieve of suitable mesh, and measure 200–500 μ in length. They are suspended in 2 per 1,000 agar in saline and an injection of 1.8 gm. in 12 cc. of medium maintains an effective blood level for 31 days, but it is necessary to give smaller doses at first, at shorter intervals.

For mass treatment DDS has advantages in that it is slowly absorbed and can be given by injection at relatively long intervals, but for individual treatment the more soluble sulphones may be desirable. FLOCH and GÉLARD (p. 787) used the diethyl derivative M 2196, which is rapidly absorbed when given intramuscularly. They compare this with the succinyl derivative 1500 F which can be given orally or by injection.

SHORT (p. 373) shows that when PAS and Sulphetrone were administered simultaneously in animals the blood concentration of Sulphetrone was considerably increased soon after the administration and that the Sulphetrone curve closely approximated the PAS curve. The concentration of Sulphetrone in the tissues was considerably reduced.

BYERS and WOLCOTT (p. 652) found that, under treatment with sulphones, in half the lepromatous patients the nasal mucus became negative in a year, but skin scrapings became negative in 1–10 years in only 10 per cent. PALENCIA *et al.* (p. 653) examined lymph from punctured skin made ischaemic by pressure, in a series of leprosy patients treated with sulphones; bacilli was found in some patients even after treatment for 5–7 years.

Good results with streptomycin are reported in tuberculoid leprosy by RAMOS E SILVA and PERYASSÚ (p. 1098), who treated a series of patients for periods of 3 months to 3½ years. SINHA (p. 787) has used combinations of streptomycin with PAS or isonicotinyl hydrazone of pyrnoic acid, together with vitamin B and thiosemicarbazone or DDS, and iron and

yeast. The only advantage of the combined treatment was that perforating ulcers, keratitis and iridocyclitis responded relatively quickly.

For the treatment of tuberculosis in leprosy patients RELVICH (p. 458) gives streptomycin and isoniazid, with good results, but as these do not act satisfactorily on the leprosy it is advantageous to give sulphones or thiosemicarbazone as well.

DAVIDSON (p. 1099), who originally observed early improvement on isoniazid, found that this was not maintained. He added thiosemicarbazone, and in spite of the fact that 22 of 47 patients suffered from toxic effects, chiefly neuritis and anaemia, he achieved results regarded as satisfactory. The treatment is suitable only for hospital administration. HALE *et al.* (p. 653) found isoniazid disappointing, but LIPPI and TUCCI (p. 548) claim some favourable action of isoniazid and Neo-tibazide in various forms of leprosy.

In an extensive trial of thiosemicarbazone LOWE (p. 163) observed satisfactory improvement during the first 2 years, but much deterioration in the third year. The late results were not as good as with the sulphones, and there was some evidence of drug resistance. He therefore abandoned thiosemicarbazone for long-term treatment in patients who could tolerate sulphones, reserving it as an alternative temporary remedy in those who could not. He (pp. 54, 458) stated that thiosemicarbazone may be dangerous to bone-marrow and liver, and the clinical and bacteriological deterioration may occur in the later stages of treatment; moreover, it must be given once or twice each day, whereas the sulphones can be spaced at much longer intervals, and it is more expensive. DHARMENDRA and CHATTERJEE (p. 54) found thiosemicarbazone on the whole less satisfactory than the sulphones—improvement occurred but was often not maintained, toxic manifestations were more frequent and the cost was relatively high. But thiosemicarbazone has a value when sulphones cannot be used.

After a preliminary trial in a few patients with lepromatous leprosy CAPURRO and WILKINSON (p. 165) were sufficiently impressed with the effect of the hydrazide of cyanacetic acid to recommend further trials.

DHARMENDRA and CHATTERJEE (p. 548) were unable to find benefit in the treatment of lepromatous and tuberculoid leprosy with cepharanthine.

MONTESTRUC (p. 653) has used cortisone successfully in treating severe leprous reactions which interfered with sulphone treatment. FLOCH (p. 54) uses colchicoside, a derivative of colchicine but less toxic, for the treatment of the lepra reaction and reports favourably on it. It has a desensitizing effect similar to that of corticotrophin and cortisone. DHARMENDRA and SEN (p. 547) did not find vitamin C useful in the treatment of reactions in tuberculoid leprosy.

At Fontilles in Spain the use of sulphones has very greatly reduced the incidence of ulcers of the legs, but some still resist that treatment, and TERENCIO (p. 787) shows that they can be treated by scraping the ulcer and skin grafting. Amniotic extracts were used by MAUZÉ (p. 165) for

either local application or injection, in the treatment of leprotic ulcers, and combined with sulphone therapy, with remarkable results. Intravenous injections of sodium dehydrocholate were used with success by LAVIRON and KERBASTARD (p. 1099) in the treatment of perforating ulcers. FISHER (p. 1100) used plaster casts with good results.

Control

ROGERS (p. 165) gives an account of the progress made towards the eradication of leprosy in recent years. He thinks that infective patients only should be isolated, but that all contacts, especially children, should be examined regularly and treated early if necessary. Measures such as these have been successful in control in some countries. Prophylaxis of child contacts by treatment in the incubation period, and the use of BCG, are also important. He (p. 983) has made an estimate of the number of persons with leprosy in the countries under British administration. He reaffirms his advice that only highly infective patients should be isolated, but that frequent surveys should be made and all newly discovered patients should receive treatment. With adequate staff and funds the disease can eventually be eradicated.

In the account of a meeting published in *Ann. Soc. Belge de Méd. Trop.* (p. 654) are statements on the history of control measures in the Belgian Congo and in French territories where many centres exist and where sulphones are extensively used. The results of sulphone treatment in the Belgian Congo are discussed, and the dosage of DDS.

In Venezuela CONVIT and RASSI (p. 650) found that intradermal BCG was able to convert Mitsuda-negative persons to the Mitsuda-positive state, and argue that it will therefore be effective in prophylaxis. JONQUIERES and MASANTI (p. 1095) vaccinated with BCG 55 lepromin-negative leprosy patients (mostly with lepromatous disease) of whom 36 were tuberculin-positive. Only a few became lepromin-positive, but 2 developed "acute lepromatisation", 1 erythema nodosum and a few had weak lepra reaction.

Rat leprosy

Although murine and human leprosy bacilli cannot be cultivated, HANKS and GRAY (p. 543) show that their biological processes can be studied. They exhibit slow but persistent endogenous metabolism and they are very susceptible to inhibition by serum and body fluids; circumstances permitting growth in tissues are more precarious than those for tubercle bacilli. Pathogenesis may be limited by interference with the utilization of external sources of energy, by drugs effective within cells, or by the more drastic action of anaerobiosis and extracellular inhibitors—but when mycobacterial metabolism is depressed the effective action of these is seriously limited. HANKS (p. 543) used a method for measuring the hydrogen transfer capacity of the rat leprosy bacillus by incubating

with tetrazolium violet, which accepts hydrogen. Metabolic activity, properly measured, affords an index of infectivity of this organism. The metabolic activity is inhibited by tissue homogenates, and *Myco. leprae-murium* is very susceptible to natural inhibitors in serum.

In further studies of the relationship between the metabolic capacity and the infectivity of the murine leprosy bacillus HANKS (p. 1100) found that at room temperature the hydrogen transfer capacity and the infectivity deteriorated rapidly, but that washed organisms could be kept from deteriorating in a refrigerator in a suspension in sucrose solution, especially if albumin and yeast were added. HANKS and GRAY (p. 1101) found that the organism was adversely affected by exposure to serum from rats and other animals, but protection against such damage may be obtained by prolonged refrigeration in albumin solutions. This adverse effect may occur *in vivo* when inoculated organisms lie in the serous exudate before phagocytosis, and a similar process may account for the difficulty in transmitting human leprosy.

NAKAGAWA and NAKAMURA (p. 1100) show that the murine leprosy bacillus can be preserved by lyophilization.

The serum proteins in murine leprosy were studied by NISHIMURA and KONO (p. 548); there was no increase in gamma globulin such as occurs in human leprosy.

CROSHAW (p. 166) used isoniazid in mouse leprosy, but the results were not so good as in tuberculosis. CHAUSSINAND *et al.* (p. 549) report adversely on isoniazid, and remark that the bacilli may develop resistance to it; GRUNBERG *et al.* (p. 985) state that it does not have a lasting protective effect.

CHANG (p. 655) shows that nicotinamide and pyrazinamide are effective in suppressing murine leprosy.

HADLER and ZITI (p. 788) found that BCG did not protect rats against subsequent inoculation of *Myco. leprae-murium*. HADLER (p. 788) inoculated guineapigs with BCG and subsequently gave them intradermal injections of BCG and lepromin. He found that the histological appearances were similar with the two substances, but that BCG gave the stronger reaction, which faded more quickly. Apparently in those conditions BCG is more rapidly lysed than *Myco. leprae*.

Charles Wilcocks

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control; Animal malaria—monkeys, other animals, birds.

COLBOURNE, M. J. **The Effect of Prolonged Examination of Blood Films on the Parasite Rate.** *West African Med. J.* 1956, Mar., v. 5 (n.s.), No. 1, 26–30, 1 fig.

Thick blood films taken in malaria surveys in the Gold Coast are normally examined through 140 fields (at a magnification of 600 times), giving an adult parasite rate of 54 per cent.; if more fields are examined, the rate may rise to 62 per cent. In the same way, the infant parasite rate may rise from 52 to 61 per cent. if examination of the films is prolonged.

Detailed observations were made on 100 pregnant women in Accra to see if repeated examination of thick blood films would increase the gametocyte rate. Ten films were taken from each woman and 100 fields of each film were examined. The rate rose from 7 per cent. in single film examinations to 20 per cent. when all 10 were examined, the increase falling off after about 6 films (when the rate was 18 per cent.). The density of gametocytes was 2 per cmm. or less in 14 of the 20 "positive" women, and was 14 per cmm. or more in only three.

The parasite rate rose from 30 per cent. to 41 per cent. if 1,000 instead of 100 fields were examined.

P. C. C. Garnham

VENKAT RAO, V. **Malaria Vectors of India. VIII. *A. sundaicus* Rodenwaldt, 1926.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1956, Mar., v. 4, No. 2, 27–35, 1 map. [23 refs.]

This paper provides a brief account of the biology of *Anopheles sundaicus* in India. Its limited and interrupted distribution on the coast from about Vizagapatam into W. Bengal favours efforts for its eradication. Note is taken, in a footnote, of resistance to DDT in *A. sundaicus* reported from Java, in Indonesia [this *Bulletin*, 1955, v. 52, 329].

D. S. Bertram

POSTIGLIONE, M. & VENKAT RAO, V. **A Review of the Status of *A. sundaicus* in Burma.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1956, May, v. 4, No. 3, 65–70. [15 refs.]

"*A. sundaicus* has been recorded throughout the Arakan region and in a few isolated localities in the coastal areas of the Delta region. In the former region, dissections so far carried out have failed to produce full evidence of its complicity in malaria transmission. This may be due

to paucity of dissections or to the possibility of the presence of a non-vector form of *sundaicus*. A detailed pre-operational study of areas not now under malaria control might resolve this issue."

DAVIDSON, G. & GANAPATHIPILLAI, A. **Observations on the Bionomics of the Adults of some Malayan Anopheline Mosquitoes.** *Ann. Trop. Med. & Parasit.* 1956, June, v. 50, No. 2, 137-46. [11 refs.]

The work reported was done from February to June in or near an aboriginal resettlement, a few miles east of Kuala Lumpur. Except for one water-buffalo used in timber-hauling and tethered 50 yards from the village, cattle were absent; there were a few dogs and chickens. *Anopheles maculatus* was at its peak in breeding. Earlier work in Malaya by WHARTON [this *Bulletin*, 1952, v. 49, 360; 1954, v. 51, 137] was in similar conditions but cattle were present. Catching methods were various and their results are compared. On bare legs of bait boys substantial numbers, representing 8 species, were caught, the notable results being *A. aconitus* (11 per cent. of total), *A. maculatus* (12 per cent.), *A. karwari* (24 per cent.) and *A. philippensis* (37 per cent.). The same order of abundance occurred with a man-baited mosquito-net trap. With huts with exit-traps and entry-louvers overall catches were very much smaller and 92 per cent. of all mosquitoes taken, most of them having entered, fed and gone into the exit-traps, were *A. maculatus*. Another type of trap, successful in catching *A. gambiae* in Africa as it entered huts, was not successful with *A. maculatus*. *A. maculatus*, finally, was the most numerous species in exit-traps in the houses of the aborigines.

A. maculatus and *A. philippensis* were the commonest species taken in calf- or dog-baited devices, with the latter species predominating; *A. philippensis* was also commonest of the 11 species taken on the single water buffalo, with *A. indiensis* the next numerous. Small numbers (25) of mosquitoes taken resting in vegetation by day included 15 *A. maculatus* with fresh blood shown to be human.

It is concluded that, in this cattle-free area of Malaya, *A. maculatus* feeds mainly on human beings and chiefly out-of-doors, though it is the one species which will enter houses in any numbers. An infection rate of 1·07 per cent. for sporozoites was obtained in 1,217 *A. maculatus* which is, as shown by other older data too, likely to be the only vector of malaria in the locality.

D. S. Bertram

LEA, A. O., DIMOND, J. B. & DELONG, D. M. **Role of Diet in Egg Development by Mosquitoes (*Aedes aegypti*).** *Science.* 1956, May 18, v. 123, 890-91, 1 fig.

Previous experiments by the authors have shown that *Aedes aegypti* and *Anopheles quadrimaculatus* will develop viable eggs in the absence

of blood if fed on skim milk and honey on a saturated pad. Numerous substances in sugar solution have now been tested and only certain proteins, such as citrated beef blood, fresh skim milk, powdered egg albumin, and proteose peptone, or enzymatic digests of proteins such as soya bean meal, yeast, casein and lactalbumin, were found to stimulate egg production in *Aëdes aegypti*. Oviposition following feeding on egg albumin and proteose peptone occurred in *A. quadrimaculatus*. Experiments with 12 amino-acids, in which each amino-acid was omitted singly, showed that 8 (arginine, isoleucine, leucine, lysine, phenylalanine, threonine, tryptophan and valine) were essential for any egg production, when given in a sugar-plus-salt solution. Omission of 4 amino-acids (histidine, methionine, cystine and glutamic acid) reduced egg production. Optimum concentrations of each of these 12 amino-acids have been established by experiment, and a balanced medium of these acids produced an increase in egg production. Preliminary tests show that lipids in blood are not essential for the production of eggs but that minerals may be essential, and the effect of vitamins is being investigated.

B. R. Laurence

VAN DER KUYP, E. **Mosquitoes of the Netherlands Antilles and their Hygienic Importance.** Reprinted from *Studies on Fauna of Curaçao & other Caribbean Islands*. The Hague. 1954, v. 5, No. 23, 37-114, 10 figs. [Numerous refs.]

The total area of land in the Netherlands Antilles is about 950 square kilometres and it may be conceived as 2 groups of islands 900 kilometres apart, referred to as the Curaçao Group and the St. Martin Group, lying east of Venezuela and of Puerto Rico, respectively. Characteristics of climate, soil and vegetation are given and some account of population, medical services and sanitation.

Descriptions are then given of the various stages of the mosquito species found on the islands which include on at least one or two of the islands, *Anophèles pseudopunctipennis pseudopunctipennis* and *A. albimanus*, and 18 species of culicine including *Aëdes aegypti*, *C. quinquefasciatus* [*C. fatigans*], *Haemagogus anastasionis*, and one or two others reported biting man viciously. Keys are given to the aquatic and adult stages. There is a good deal of detail about breeding sites and dates, biting habits and resting places, some of it tabulated. The figures illustrate larval features and there are maps of observed distribution of species on several of the islands and in some townships.

The islands are not malarious, *A. p. pseudopunctipennis* being inefficient, largely zoophilic, and not abundant. Persons with malaria who do reach the islands are treated satisfactorily and no chronic cases develop. Some of the low incidence of *W. bancrofti* infection is indigenous; elephantiasis is rare. Although *Aëdes aegypti* is prevalent, yellow fever has not been reported since the early years of the century;

there are no monkeys to harbour the virus. Dengue is quite usual in European newcomers, but not recognizably so in the islanders; the vector is accepted as *Aedes aegypti*. It is inferred that encephalitis occurs and is yet to be studied. The biting nuisance of several of the mosquito species is noticeably troublesome to newcomers and babies who, however, develop an immunity "after some time", specific to species.

Musca domestica is the commonest insect on incoming aircraft, mosquitoes being extremely rare and anyway in poor condition. It is not certain what the source was of *Aedes aegypti* and *Culex p. fatigans* breeding in schooners in Willemstad, the port of Curaçao.

There is a veiled reference to a nearby "foreign port" which denied having yellow fever cases in February 1946; it was deemed appropriate, however, to take then the usual precautions with all seaborne and air-borne traffic entering the Netherlands Antilles from the port in question. Small progress is being made on Curaçao and Aruba to control *Aedes aegypti*; all aircraft from foreign airports and one island of the St. Martin group of the Antilles are sprayed with insecticide on arrival at Curaçao and Aruba.

D. S. Bertram

MILLER, M. J., NEEL, J. V. & LIVINGSTONE, F. B. **Distribution of Parasites in the Red Cells of Sickle-Cell Trait Carriers infected with Plasmodium falciparum.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, May, v. 50, No. 3, 294-6.

Three children with the sickle-cell trait were studied in Liberia in relation to the distribution of *Plasmodium falciparum* in sickled and non-sickled cells. The blood films were prepared in the following way:—

0.1 cc. of blood from a pricked finger is taken into a tuberculin syringe through a short needle and 0.2 cc. of sodium metabisulphite solution is immediately drawn up plus an air bubble and the two fluids are mixed in the syringe; the air is expelled and sickling is allowed to continue for $\frac{1}{2}$ to 1 hour, the process being checked by examining a drop under a cover slip; 0.15 cc. of half-strength formalin is then drawn into the syringe and mixed; fixation is complete in about 2 hours and the red cell suspension is poured into a Wassermann tube and distilled water is added to the top. The cells are allowed to sediment in a refrigerator overnight. The following morning, the supernatant fluid is removed and replaced by fresh serum in a quantity slightly greater than that of the cells. Thin films are prepared and are stained by Wright's stain. Control films are prepared in a similar way with malaria-infected blood from a non-sickler in order to check that the process itself did not cause distortion of normal erythrocytes.

In case 1 (showing a parasite density of 2,500 per cmm.) 48 per cent. of the cells sickled; 53 per cent. of parasitized cells were normal and 47 per cent. were sickled. In case 2 (parasite density 2,000 per cmm.) 95 per cent. of the cells sickled: 7 per cent. of parasitized cells were

normal and 93 per cent. were sickled. In case 3 (parasite density 4,500 per cmm.) 63 per cent. of the cells sickled and an additional 13 per cent. were deformed: 59 per cent. of parasitized cells were normal and 41 per cent. sickled.

These findings indicate that the presence of the special haemoglobin in an erythrocyte does not prevent invasion by *P. falciparum*, and if it can be assumed that the "normal" (= non-sickled) cells in cases 1 and 3 do not contain the special haemoglobin, then the equal distribution of parasites in sickled and non-sickled cells suggests that the former are equally susceptible to invasion. Nevertheless the authors are careful to point out that the final fate of the parasite in cells containing the abnormal haemoglobin may well be premature death in the capillaries of the internal organs and in this manner the progress of an infection could be lessened. [See MACKEY and VIVARELLI, this *Bulletin*, 1954, v. 51, 508.]

P. C. C. Garnham

DEEGAN, T. Some Properties of Different Types of Haemoglobin in 0·5 N Sodium Carbonate Solution. *Ann. Trop. Med. & Parasit.* 1956, June, v. 50, No. 2, 187-93, 5 figs.

There has been some controversy in the past about the stability of haemoglobin in half normal sodium carbonate solution. The author, prior to isolation of the pigment of different malaria parasites [see below], has re-investigated this question. This was done by observing the optical density of the pigment solution at 576 m μ . in a spectrophotometer in the above solvent of pH 10·9, and also in M/10 borate buffer at pH 9·20 in which it is known to be stable. Observations were also made on the effect of concentration and temperature on stability. Human, monkey and rat haemoglobin was used in these studies. Solutions were made by adding known volumes of whole blood to the solvent plus saponin to effect complete lysis. The results indicated that the different haemoglobins were not stable in N/2 sodium carbonate and that splitting of protein from the haem part of the molecule occurred, but the rate of this reaction varied with the species of haemoglobin employed. All haemoglobins were stable in M/10 borate buffer which should, therefore, be much more suitable for extraction of malarial pigment when associated with haemoglobin.

J. D. Fulton

DEEGAN, T. & MAEGRAITH, B. G. Studies on the Nature of Malarial Pigment (Haemozoin). I.—The Pigment of the Simian Species, *Plasmodium knowlesi* and *P. cynomolgi*. *Ann. Trop. Med. & Parasit.* 1956, June, v. 50, No. 2, 194-211, 8 figs. [33 refs.]

Since the investigations by earlier workers on malarial pigment extracted from tissues, SINTON and GHOSH [this *Bulletin*, 1935, v. 32,

127] and others have used the washed parasites of different malaria species as a source of this material. In these extractions weak alkali or strong phenol have been used, and the present authors are of the opinion that this treatment gives rise to artefacts.

The present investigation was undertaken to find if the pigment, which has been accepted as haematin, was combined with another moiety containing nitrogen. It was prompted in part by the fact that succinic dehydrogenase which appears to play an important part in the metabolism of *Plasmodium* is inhibited by haematin but not when in combination with a nitrogenous compound [*ibid.*, 1946, v. 43, 1118; 1951, v. 48, 874]. It has been repeatedly pointed out that any haemoglobin not removed from the parasites by the washing procedures employed would also be a source of haematin. In the experiments on *P. berghei* the isolated cells were washed a number of times with saline before lysis with water or saponin. The authors found that haemoglobin, sometimes only in traces, was present in subsequent extracts of the cellular material with borate buffer. The method finally employed to obtain haemoglobin-free parasites was that described [*ibid.*, 1946, v. 43, 824, 825] with washing in CO₂-saturated 1 per cent. saline and then in CO₂-saturated ice water. In addition, parasites were generally disintegrated by freezing and thawing before extraction with 0·1 M borate buffer of pH approximately 9·2. The position of the spectral bands in the extract when compared with that of haematin suggested that it was not free haematin which was present in these extracts. The spectral behaviour of the extracted material under a variety of conditions is described. In 90 per cent. phenol, extracts of parasite debris gave rise to acid haematin. It is believed that the latter has its origin in rupture of a haematin complex during extraction. There were distinct differences in the properties of the 0·5 N sodium carbonate extracts described by earlier workers and those obtained here.

The authors conclude that the properties of the extracted material cannot be explained on the basis of its haematin nature alone, but was more probably due to a haematin-denatured protein complex. A haematin-containing compound of this type would not, moreover, inhibit the succinoxidase system apparently essential for the parasites, to which attention has been drawn above. The character of the pigment material extracted was essentially the same in parasites of *P. knowlesi* and in tissue pigments in *P. cynomolgi* infections.

J. D. Fulton

DEEGAN, T. & MAEGRAITH, B. G. **Studies on the Nature of Malarial Pigment (Haemozoin). II.—The Pigment of the Human Species, *Plasmodium falciparum* and *P. malariae*.** *Ann. Trop. Med. & Parasit.* 1956, June, v. 50, No. 2, 212–22, 7 figs.

In continuation of their investigation on malaria pigment the authors have now examined that of *P. falciparum* and *P. malariae*. Similar

methods were employed to those described above for the extraction. In the case of *P. falciparum* in particular the difficulty in obtaining sufficient parasite material made it less easy to report accurate analyses. Tissue samples provided more significant results, and the characters of the pigment were found to resemble closely those of the pigment of *P. knowlesi*. In the case of *P. malariae* exact spectrophotometric data were not obtained, but visual observations strongly suggested that the pigment structure also resembles that of *P. knowlesi*. As before, a complex of haematin and a nitrogenous compound is suggested as the basic structure of these pigments.

J. D. Fulton

PIRLO, F. A proposito della cosiddetta "nefrite malarica". Contributo anatomico clinico. [The So-Called "Malarial Nephritis". A Clinico-Anatomical Study] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1956, June, v. 37, No. 6, 293-326. [39 refs.] English summary (7 lines).

The author investigated 12 cases clinically diagnosed as malaria. In 6 parasites were found, while in the remainder the fever disappeared after quinine therapy. Various tests of kidney function were carried out, e.g., concentration, dilution, etc., but no alteration ascribable to the malaria was found.

The kidneys in 23 cases in which necropsy had shown some evidence of chronic malaria were examined histologically, but only in 2 was there any evidence that the malaria could have been the cause of the nephritis found.

W. K. Dunscombe

KEITEL, H. G., GOODMAN, H. C., HAVEL, R. J., GORDON, R. S. & BAXTER, J. H. Nephrotic Syndrome in Congenital Quartan Malaria. *J. Amer. Med. Ass.* 1956, June 9, v. 161, No. 6, 520-23, 3 figs. [10 refs.]

A Negro child of 21 months and her mother were found to be suffering from *Plasmodium malariae* malaria. As neither had ever been outside the district of Washington, D.C., which is believed to be free of mosquito-propagated malaria, and as the mother was a heroin addict, it was concluded that the mother had acquired the infection from a contaminated syringe and the child congenitally. The child, being illegitimate, had been cared for by foster parents from the age of 6 weeks.

When the child at the age of 15 months was investigated for a quotidian fever, malaria was not suspected, although full blood investigations were made and "strange cells" were observed in a blood smear. A diagnosis of pyelonephritis and a blood dyscrasia of an unknown type was made. Irregular fever continued and at 19 months of age abdominal swelling was noted and at 20 months there was also oedema of the face

and legs. A blood smear now revealed *P. malariae* in large numbers and other investigations supported a diagnosis of nephrosis. Treatment with chloroquine led to a rapid, full and permanent recovery.

The mother was traced and it was found that she, too, showed *P. malariae* in a blood smear. As the infection was presumed to have been conveyed by blood inoculation to the mother and transplacentally to the daughter, there appeared to be no danger of relapses of exo-erythrocytic origin. The mother was also successfully treated with chloroquine.

Frederick J. Wright

See also p. 1386, CHAUDHURI *et al.*, **Chronic Splenomegaly.**

WALLACE, R. B. **Residual Spraying; Mass Suppression and *A. maculatus*.**

Med. J. Malaya. 1956, Mar., v. 10, No. 3, 191-231, 2 figs. & 18 charts. [17 refs.]

The author has had opportunities for field trials on malaria control in an inland rubber estate of 10,000 acres in Malaya, consisting of 12 divisions. *Anopheles maculatus* is the vector. Gamma BHC was used in 3 divisions as a residual spray from 1950 to 1955. In 1951 it proved ineffective and mass drug suppression was introduced as an emergency. The reason for the failure is not clear, but the insecticide was thereafter sprayed each year in premises once a month for the 4 months preceding the peak in *A. maculatus* density in order that the mosquitoes would "contact a good dose of B.H.C." A dosage of 20 mgm. per sq. ft. was aimed at in each spraying of 1954. In 1955 only 3 sprayings were given. By 1953 malaria incidence was as low as in other divisions on drug suppression, and the seasonal epidemic was also kept at a low incidence in later years. In other divisions Dieldrex-15 was tried in 1955, sprayed once in February, and followed up with baitman catches until June, the insecticidal treatment not eliminating the mosquitoes by any means but being associated, to the author's satisfaction, with a reduction in malarial incidence in the division.

A second part of the paper recounts work on the use of proguanil, chloroquine, Resochin, amodiaquine, pyrimethamine besides mepacrine and others, for drug control of malarial incidence. It would seem that insecticide sprayings were also involved in the history of drug suppression, at least in some divisions, and a combination of both insecticide control and drug suppression was ultimately instituted in all but 3 of the divisions in 1955. This gave "100 per cent protection".

[This paper, like an earlier one (this *Bulletin*, 1951, v. 48, 525) is much in need of better planning in its text, which is extremely confusing and rarely gives proper references; the references at the end are most erratic and some under the author's own name lead, so far as the abstracter could find, to non-existent papers. The author deserves more editorial guidance.]

D. S. Bertram

GABALDON, A. Influencia del rociamiento intradomiciliario con DDT sobre las tasas específicas de mortalidad general en Venezuela. [Influence of Interior House Spraying with DDT on Specific General Death Rates in Venezuela] *Bol. Oficina Sanitaria Panamericana*. 1956, Feb., v. 40, No. 2, 93-106, 2 figs.

In a previous publication the author described the marked decline in the general mortality rates, notably in the mortality ascribed to diarrhoea and intestinal infections, that had occurred in Venezuela as a collateral result of the nation-wide DDT spraying campaign [this *Bulletin*, 1956, v. 53, 284], which had eliminated malaria from a large part of the country. Throughout the decade 1941-50 there was an uninterrupted fall in the annual general death rates, more marked in the second quinquennium—from 16·4 in 1941 to 14·8 in 1945, and from 14·5 in 1946 to 10·9 in 1950. The decline in mortality was not confined to the malarious parts of the country which had been treated with DDT, though it was much more marked there than in malaria-free areas.

In this paper an analysis is made of the nature and extent of the declining mortality in the different age-groups in malarious and malaria-free *municipios* alike. Those *municipios* that had some health organization were compared with those lacking such facilities. The malarious *municipios* were subdivided into 4 groups according to the proportion of their populations that had been accorded DDT protection: less than 25 per cent.; from 25 to 49 per cent.; from 50 to 74 per cent.; 75 per cent. and over. The results of the study are fully set out in tables and graphs. The decreased mortality in malarious areas was largely confined to the age-groups under 20. In the malaria-free areas the fall chiefly concerned age-groups over 20.

The conclusion is reached that in 1950 DDT spraying saved the lives of 13,473 persons on the assumption that without it the trend in the total mortality rate would have been similar to that observed in malaria-free areas.

Norman White

VERAIN, Alice & VERAIN, A. Premiers essais d'enregistrement de la température, au cours de l'affection due au *Plasmodium berghei*. [Preliminary Studies in Recording Temperature during *Plasmodium berghei* Infections] *C.R. Soc. Biol.* 1955, Dec., v. 149, Nos. 23/24, 2174-6.

The fluctuations of rectal temperature of male rats which had been immobilized in plaster were measured by means of a thermocouple connected to a sensitive recorder. In normal rats a cyclical variation of temperature was found of about 0·6° on either side of 37°, with the maximum at midnight and the minimum at 1 p.m.

The study by this technique of rats infected with *Plasmodium berghei* revealed no cycle of temperature that could be ascribed with certainty to

the development of the parasite. Various fluctuations of temperature were, however, noted: rises of $1\cdot5^{\circ}$ - $2\cdot0^{\circ}$ occurring every 4-5 hours and lasting about 1 hour, undulations with 1-hour period and $0\cdot5^{\circ}$ amplitude, and temperatures maintained at 39° with rises to 41° falling to 38° - $38\cdot5^{\circ}$.

The authors believe that the 5-hour fluctuations may represent the rupture of significant numbers of schizonts, but defer their conclusions until the work is repeated with more sensitive recording apparatus.

[It seems possible that the results might have been affected by the discomfort caused to the experimental animals by immobilization: this they note was sufficient in some instances to cause visible signs of dehydration.]

W. E. Ormerod

SERGENT, Ed. & PONCET, Alice. Étude expérimentale du paludisme des rongeurs à *Plasmodium berghei*. IV. Résistance acquise. [Experimental Study of Rodent Malaria due to *Plasmodium berghei*. IV. Acquired Resistance] *Arch. Inst. Pasteur d'Algérie*. 1956, Mar., v. 34, No. 1, 1-51, 12 graphs. [Refs. in footnotes.]

The authors tested adult white rats, which had recovered from an attack of *Plasmodium berghei* (Keyberg 173 strain) either spontaneously or with the help of Nivaquine [chloroquine], in regard to their immune status by exposing them to a further challenge with the homologous strain of parasite. A total of 144 rats were re-inoculated intraperitoneally 1 to 27 months later with 30-40 million parasites; at the same time new rats were inoculated as a control. Thirty-nine per cent. of the former developed an infection, while 61 per cent. did not show parasites. The attacks were of feeble intensity in nearly all instances. In 9 rats, however, the parasitaemia was of the same order as that of the primary attack, and in 4 it was greater and led to the death of the animals. These 4 rats, instead of acquiring an immunity, seem instead after 11 to 24 months to have become sensitized to the parasite. The lapse of time between the inoculations affects the results, in that the shorter the interval the greater is the number of rats failing to respond to the re-inoculation. Practical difficulties make it impossible to demonstrate the existence of a true "sterilizing immunity"; but in some instances at least, premunition is responsible for the negative response of the rat to re-inoculation of *P. berghei*.

The authors attempted to solve this question by administering an anti-malarial drug (2.5 mgm. Nivaquine per 100 gm. weight daily) to destroy any latent parasites responsible for the state of premunition and leave the animal protected only by its "sterilizing immunity" if such exists. White mice treated with Nivaquine survived the primary attack and relapse, but all died after an untreated re-inoculation. White rats treated with Nivaquine either during the first attack or later in the "metacritical" stage proved largely resistant to re-infection, though in

one rat parasites persisted for 6 months being demonstrable on inoculation of blood and organs. Thus drug treatment does not always sterilize the infection, which is transformed into a latent condition. Latency may exist in many instances but is not demonstrable owing to the difficulty of freeing the hidden parasite perhaps even from an exo-erythrocytic source. [See also this *Bulletin*, 1956, v. 53, 717.]

P. C. C. Garnham

NAIR, C. P. & RAY, A. P. **Studies on Nuri Strain of *P. knowlesi*. Part X. Therapeutic Effect of Bromoguanide and its Active Metabolite.** *Indian J. Malariaiology.* 1956, Mar., v. 10, No. 1, 11-16. [21 refs.]

The activity of bromoguanide (the bromo analogue of proguanil) and its metabolite, the dihydrotriazine described by BAMI [this *Bulletin*, 1954, v. 51, 776] was tested against the virulent Nuri strain of *P. knowlesi* transmitted by blood inoculation in a total of 99 monkeys. The methods employed have been described previously [*ibid.*, 1956, v. 53, 404]; the drug was given by mouth when the infection was low and its progress was followed in stained smears. The effect of different dosage was determined so that reduction in numbers as well as temporary and complete clearance of parasites was effected. In general it was found that both the parent substance and its metabolite exerted a slow effect on the infection and the quinine equivalent of each was low. Earlier work had shown that both were much more active when tested against other species of malaria maintained in laboratory animals.

J. D. Fulton

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—human, animal; American—Chagas's disease and other trypanosome infections. In each form the following order is followed:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

MOSSOP, R. T. **An Early Case of Trypanosomiasis treated with Pentamidine Isethionate.** *Central African J. of Med.* 1956, June, v. 2, No. 6, 224.

" A case of early Rhodesian trypanosomiasis is described, in which the use of pentamidine isethionate produced a rapid clinical cure and an equally rapid sterilisation of the blood.

" Attention is drawn to a communication by Gelfand and Alves in which the findings of several workers are compared, showing that

pentamidine isethionate is usually effective in early forms of sleeping sickness."

[See this *Bulletin*, 1954, v. 51, 891.]

FAIRCLOUGH, R. Insecticidal Fogs against Tsetse Flies on Trains. *Bull. Entom. Res.* 1956, July, v. 47, Pt. 2, 193-6.

The dispersal of tsetse flies, particularly *Glossina longipennis*, into country normally free from them by carriage on trains passing through a fly-belt has long presented a special problem in tsetse control on the Mombasa-Nairobi railway [this *Bulletin*, 1950, v. 47, 527]. About 8 years ago the matter was serious because of cattle trypanosomiasis spread by these flies. Although the incidence is now less, and adequately controlled by drugs, the difficult problem of "de-flying" trains has been under continual test by various means. Satisfactory fly control was obtained with the use of a Swingfog Pest Control Unit for spraying DDT as a fog over the outside of goods trains. An operator sprayed along one side starting at the engine and another covered the other side starting at the back of the train. The foggings were carried out at Makindu where all trains normally stopped. The treatment for each train was completed in about 10 minutes and required about 2 pints of insecticide (Sovacide F was found to be a very good solvent for the 15 per cent. DDT solution used). Fly counts on fogged trains 20 miles beyond the fly belt were reduced by at least 60 to 70 per cent.

With an estimate of 2,000 trains per year and including capital outlay on fogging machines and electrical equipment and operators' wages, the annual cost would be about £1,000 per annum. Although this method was comparatively simple, rapid and effective these costs, so far as can be assessed at present, make it considerably less economical than the therapeutic control of trypanosomiasis in force in the cattle areas affected.

D. S. Bertram

PETRŮ, M. & VOJTEČHOVSKÁ, Milena. Průběh experimentální trypanosomiase v barbiturátové narkóze. [The Course of Experimental Trypanosomiasis during Barbiturate Narcosis] Českoslov. Parasit. Prague. 1955, v. 2, 105-56, 6 charts. [Numerous refs.]

Barbiturate narcosis lasting from several hours to 3 days prolonged the negative phase of *Trypanosoma gambiense* and *T. equiperdum* infection in rats and mice and caused a reduction in the number of parasites in the blood. The induction of narcosis at the onset of hypoglycaemic coma in rats prevented the occurrence of convulsions and prolonged the survival time by about 36 hours, although the fall in blood sugar level and the multiplication of the parasites were unaffected. The effects were

ascribed to a reduction in the rate of multiplication of the trypanosomes due to the fall in body temperature which occurred during narcosis.

D. J. Bauer

HOARE, C. A. **Morphological and Taxonomic Studies on Mammalian Trypanosomes. VIII. Revision of *Trypanosoma evansi*.** With a statistical analysis by J. W. TREVAN. *Parasitology*. 1956, May, v. 46, Nos. 1/2, 130-72, 10 figs. [Numerous refs.]

Thirty strains of *Trypanosoma evansi* from diverse mammalian hosts in the Old World were studied in order to establish their taxonomic relationships and the affinity of this species as a whole to members of the *brucei* group. Much of the work depended upon the incidence of polymorphism, and useful criteria are given for the recognition of stumpy, intermediate and slender forms of the trypanosome. Three strains were observed closely for many years; strain Nb from a horse in Bulgaria showed stumpy forms (up to 25 per cent.) on 4 occasions, strain AA from a camel in the Sudan showed stumpy forms (with a maximum of 2 per cent.) on 8 occasions, while strain Cc also from a Sudanese camel showed a remarkable and persistent degree of polymorphism with up to 61 per cent. of stumpy trypanosomes, the latter sometimes exhibiting posterior nuclear forms. This persistence of polymorphism for 17 years through laboratory passage in animals is in striking contrast to what happens to members of the *brucei* group in which polymorphism lasted only 7 months in *T. gambiense*, in *T. rhodesiense* only 24 months, and in *T. brucei* only 30 months after the original isolations.

Variations in the mean length of 22 strains of *T. evansi* offered no help in separating them taxonomically, the typical strain measuring from 15 to 34 μ in length, with a mean of 24 μ , and polymorphic strains comprising stumpy forms 16.8-19.6 μ , intermediate 19.5-20.7 μ and slender 23.0-24.9 μ .

The appearance of polymorphism in *T. evansi*, even though usually sporadic, means that this species must now be placed in the *brucei* group. It probably originated in tropical Africa from camels infected with *T. brucei* which strayed outside the tsetse areas and became the source of strains of the parasite transmitted mechanically by tabanid flies. It is perhaps significant that the highest degree of polymorphism was shown by a camel strain isolated from a place only a little north of the tsetse belt, and thus probably only recently evolved from *T. brucei*.

A complete synonymy of the species is provided. P. C. C. Garnham

ROMAÑA, C., SANJURJO, D. & DE ROMAÑA, M. S. Consideraciones estadísticas sobre 634 casos agudos de enfermedad de Chagas diagnosticados en Tucumán y resistencia. [Statistical Study of 634 Acute Cases of Chagas's Disease in the Tucumán Area, Argentina] *An. Inst. Med. Regional*. Tucuman, Argentina. 1955, Dec., v. 4, No. 2, 173-80. 7 graphs. French summary.

HACK, W. H. Estudios sobre biología del *Triatoma infestans* (Klug, 1834) (Hem., Reduviidae). [Studies on the Biology of *Triatoma infestans*] *An. Inst. Med. Regional.* Tucuman, Argentina. 1955, Dec., v. 4, No. 2, 125-47, 4 graphs.

The English summary appended to the paper is as follows:—

"The author, after brief general considerations studies the biology of *Triatoma infestans* (vinchuca) in its distinct aspects: oviposition, evolution and conservation of eggs, rest before alimentation, relation between the ingested quantities of blood and the evolution, evolutive cycle and fasting capacity. The experiences were carried out under distinct temperatures and humidity, with the object of determining their influences on the biology of the vinchucas, furthermore considering the intervention of other factors, such as age and alimentation."

BARTH, R. Estudos anatômicos e histológicos sobre a subfamília Triatominae (Heteroptera, Reduviidae). IV. parte: O complexo das glândulas salivares de *Triatoma infestans*. [Anatomical and Histological Studies on the Subfamily Triatominae. IV: The Salivary Gland Complex of *Triatoma infestans*] *Mem. Inst. Oswaldo Cruz.* 1954, Sept.-Dec., v. 52, Nos. 3/4; 517-85, 54 figs. [16 refs.] English summary.

HARINGTON, J. S. Histamine and Histidine in Excreta of the Blood-Sucking Bug *Rhodnius prolixus*. [Correspondence.] *Nature.* 1956, Aug. 4, v. 178, 268.

Intense spots of leucine, histidine, and histamine besides taurine, glycine, valine, phenylalanine and alanine were obtained in paper chromatographic studies of dry excreta of *Rhodnius* fed on rabbit. Histidine also accounted for about 35 per cent. of free amino-acids in the haemolymph of these bugs. Histamine was not detected in the haemolymph so that decarboxylation of histidine apparently occurred in the gut before the appearance of histamine in the excreta. Sterile bugs also produce histamine in their excreta, and it therefore seems that decarboxylation of the histidine is a tissue process and not dependent on bacteria in the gut lumen, but there is some evidence suggesting that the bacteria do contribute to the histidine content of the excreta. In bugs fed on serum the excreta lacked histidine and there was little histamine. It is reasoned on this and other grounds that the red cells of the blood meal taken by these bugs are the main source of the histidine and histamine in their excreta.

Histidine has been reported in the haemolymph and excreta of silk-worm moth but this appears to be the first record of histamine in insect tissue and excreta. It is curious that these bugs convert harmless

histidine into a "tissue poison", histamine, as a preliminary to its excretion.

D. S. Bertram

ROCHA, H. P. & ANDRADE, Z. A. Fenômenos trombo-embólicos pulmonares em pacientes portadores de miocardite crônica chagásica. [Pulmonary Thrombo-Embolism in the Chronic Myocarditis of Chagas's Disease] *Arquivos Brasileiros de Med.* 1955, Sept.-Oct., v. 45, Nos. 9/10, 355-64, 3 figs. [14 refs.]

The English summary appended to the paper is as follows:—

"The occurrence of pulmonary thrombo-embolism during the course of the chronic cardiac form of Chagas disease was studied in 15 patients out of a series of 28 fatal cases.

"The pathogenesis of these accidents was discussed and the importance of right-sided cardiac parietal thrombosis was emphasised.

"The importance of these complications on the clinical evolution of the cardiac failure was also considered."

ANDRADE, Z. A. & ANDRADE, Sonia G. A patogenia da miocardite crônica chagásica. (A importância das lesões isquêmicas.) [Pathogenesis of Chronic Myocarditis of Chagas's Disease. Importance of Ischaemic Lesions] *Arquivos Brasileiros de Med.* 1955, July-Aug., v. 45, Nos. 7/8, 279-88, 8 figs. [18 refs.]

The English summary appended to the paper is as follows:—

"A study on the pathogenesis of the chronic Chagas myocarditis is reported. It is suggested that there are two fundamental myocardial lesions: one is inflammatory and probably results from some kind of allergic reactions, while the other is ischemic (microscopic infarcts). It is likely that the damage to the myocardial conducting system is due to this latter type of lesion. The fibrotic lesions seen so frequently at the level of the left ventricular apex are explained as secondary to the parietal thrombosis, through interference with the emptying of the small vessels in the cardiac chamber, thus rendering the subendocardial cardiac fibers ischemic."

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

LOZANO MORALES, A. Consideraciones epidemiológicas y comentarios en torno al diagnóstico y a la terapéutica de la leishmaniosis visceral mediterránea. [Epidemiology and Observations on Diagnosis and Treatment of Mediterranean Kala Azar] *Rev. Sanidad e Hig. Pública.* Madrid, 1955, Sept.-Oct., v. 29, Nos. 9/10, 513-16.

CORRADETTI, A., SACCÀ, G. & NERI, I. Valore diagnostico del faringe e delle spermatoche in *Phlebotomus perniciosus* Newstead, 1911 e in *Phlebotomus perfiliewi* Parrot, 1930. [Diagnostic Value of the Pharyngeal Teeth and of the Spermathecae in *Phlebotomus perniciosus* and *P. perfiliewi*] Riv. di Parassit. Rome. 1956, Apr., v. 17, No. 2, 105-11, 1 fig. & 2 pls. English summary (7 lines).

The English summary appended to the paper is as follows:—

"The authors, through the study of 1197 specimens of *Ph. perniciosus* and 1230 specimens of *Ph. perfiliewi*, have determined that the differential characters relative to pharyngeal teeth are constant in 100% of cases. Such a character is, therefore, the most important one for differentiating females.

"The study of spermatheca in specimens differentiated according to the pharyngeal characters has shown that the number of segments constituting the spermatheca has a very high differential value."

[The pharyngeal teeth of both sexes of both species are illustrated in the plates, and the figure shows the almost completely separate curves for the numbers of spermathecal segments (7-11 for *perniciosus* and 12-19 for *perfiliewi*).]

HEISCH, R. B., GUGGISBERG, C. A. W. & TEESDALE, C. Studies in Leishmaniasis in East Africa. II. The Sandflies of the Kitui Kala-Azar Area in Kenya, with Descriptions of Six New Species. *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, May, v. 50, No. 3, 209-26, 8 figs.

A substantial abstract of the initial paper in this series sets out the known epidemiology of kala azar in Kenya and some of the unsolved problems [this *Bulletin*, 1955, v. 52, 520]. This paper considers more the distribution, monthly incidence and bionomics of the sandflies and describes, with illustrations, the following species new to science: *Phlebotomus (P.) vansomerenae*, *P. (Sin.) graingeri*, *P. (Ser.) bedfordi*, *P. (Ser.) garnhami*, *P. (Ser.) rosannae*, *P. (Ser.) harveyi* and *P. (Ser.) multidens*.

Of several methods tried, and described, the 24-hour catch on human bait proved best for catching anthropophilic species. Including the new species above, 17 species and varieties of *Phlebotomus* have been taken in the Kitui kala azar area. Eight species bite man but *P. garnhami* is the only one biting in large numbers with peaks of activity in the morning and evening. (*P. garnhami* is the species designated provisionally at first as *P. (Ser.) sp. nov. 2.*) Anterior development of flagellates was found in 5 per cent. of these sandflies fed on a cutaneous *Leishmania* lesion and, although this is some indication of vector potential, it is thought to be too low for practical significance. Moreover, cases of kala azar

showed only slight increases 6 months after a seasonal peak of *P. garnhami*. Biting usually occurred near termitaries, or in millet fields, and occasionally in houses. Suspicion inclines now to fall on *P. martini* and *P. vansomerenae*, both taken biting man and related to the major group. Both occur near termitaries, the latter also in small numbers in huts, tents and outdoor pit latrines. Their susceptibility to infection is yet to be investigated.

D. S. Bertram

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

WOODWARD, T. E. Clues to better understanding of the Nature and Treatment of Certain Infectious Diseases. *Amer. J. Med. Sci.* 1956, Apr., v. 231, No. 4, 369–81, 8 figs. [27 refs.]

The author asks the question: what characterizes the underlying biochemical and physiological disturbances leading to pathological change and to death in certain acute specific fevers? He envisages that in the future, treatment of serious infections will consist of the administration of an antibiotic for microbial control, and also the administration of an essential metabolic substance or substrate necessary for proper cell function. He believes that research concerning cell function and biochemical determinants of infection will provide the clues to his original question.

He illustrates his points by reference to various diseases. Attention is first drawn to dilatation of the capillaries and extravasation of blood which occurs in epidemic haemorrhagic fever and infections produced by known rickettsiae. The problem of how rickettsiae or their toxins act upon blood vessels, is, it is stated, unknown, but the mechanics of the action appear clear—there is vasodilatation and increased capillary permeability. The toxic action of rickettsiae on capillary endothelium may involve alterations of essential metabolic pathways. For example, it has been demonstrated that suspensions of *Rickettsia mooseri* may oxidize glutamic acid through pathways involving alpha ketoglutaric, succinic, fumaric, malic, oxalacetic and pyruvic acids [this *Bulletin*, 1952, v. 49, 681]. Rickettsiae may compete with their host cells for these Krebs cycle intermediates to such an extent that capillary damage might result from diminished production of high energy phosphate bonds.

Attention is next drawn to the ability of various micro-organisms to reside in tissues without causing overt manifestations of disease. This occurs, for example, in the tissues of convalescent patients, and the suggestion is quoted that Brill's disease is recrudescence typhus caused by rickettsiae that have resided in the host for years after the initial illness.

It is suggested that for reasons not understood equilibrium between organism and tissue may be upset and give rise to active disease. It is pointed out that recurrent rickettsial infection has been produced through stress mechanisms, and in primates experimentally infected with rickettsiae a second infection may be provoked months after the first by administering large doses of corticoids. The recurrent disease cannot be ascribed to reduction of antibody by hormonal influence. It is possible that accumulation of lactic acid in tissues exerts a bacteriostatic action and accumulation of keto-acids favours infection.

It is next suggested that the skin lesions of rickettsial disease and meningococcaemia resemble those seen in the Shwartzman reaction which occurs when rabbits are given two successive intravenous injections of Gram-negative bacterial endotoxin. The reaction is apparently motivated by circulating polymorphonuclear leucocytes.

Finally a case is described in which death occurred on the fourth day of the illness in pneumonic plague. Organisms had been demonstrated on the second day of the illness, yet at necropsy suitable bacteriological methods failed to recover them. From this it is concluded that there is a need for better understanding of the true nature of this and other infections. [This is a stimulating and far seeing, if involved, paper.]

A. W. Woodruff

SNYDER, J. C. **The Rickettsiae: Comments on Recent Observations on Biology and Epidemiology.** Amer. J. Trop. Med. & Hyg. 1956, May, v. 5, No. 3, 461-3.

The author discusses the importance of certain findings in recent studies of rickettsiae which throw light on their biological and epidemiological features. Reference is made to experiments of BOVARNICK and ALLEN [see this *Bulletin*, 1955, v. 52, 349], who found that the avirulent E strain of *Rickettsiae prowazeki* lost its toxicity for mice, its infectivity for chick embryos, and other aggressive properties, after freezing and thawing in isotonic salt solution. These properties could be partly restored by incubating the rickettsiae in the presence of diphosphopyridine nucleotide (DPN) and coenzyme A for 2 hours at 34°C.

Other workers have shown that *R. rickettsi* isolated in the avirulent condition from the tick *Dermacentor andersoni* could be converted to the virulent phase by treatment *in vitro* with DPN and coenzyme A, and that virulent *R. rickettsi* could be deprived of its virulence by incubating it in the presence of para-aminobenzoic acid, but that this effect could be prevented by adding DPN and coenzyme A to the culture.

In these experiments modifications in the virulence, similar to those occurring naturally in the tick, have been produced artificially by the above chemicals.

The implications of the prolonged survival of *R. prowazeki* in man after attacks of louse-borne typhus fever are also discussed. Reference is made to the finding by PRICE [*ibid.*, 1955, v. 52, 621] of *R. prowazeki*

in tissue cultures inoculated with tissue from lymph nodes of persons who had immigrated to the U.S.A. from Russia more than 20 years previously. The findings of MURRAY *et al.* in Yugoslavia in 1950 [*ibid.*, 1952, v. 49, 383] are stated to have shown the validity of Zinsser's hypothesis that "the recrudescence of epidemic typhus is the event which can initiate new outbreaks of typhus". The author adds that "it is clear that the inter-epidemic reservoir of epidemic typhus is man". [There is, however, little evidence of the spread of infection from patients with Brill's form of typhus to susceptible contacts, though thousands of these must have been exposed to risk of infection in New York in the conditions of louse infestation and overcrowding which prevailed in the early period of Jewish immigration from Europe.]

Reference is also made to the evidence of the persistence of rickettsiae in lymph nodes of patients who have suffered from scrub typhus [*ibid.*, 1953, v. 50, 207] and Rocky Mountain spotted fever [*ibid.*, 1955, v. 52, 525]; the author postulates that the clinical counterpart of Brill's disease will be found in these diseases and that it may serve as a source of infection for the arthropod vectors.

[It does not seem likely that the intervention of human reservoirs of infection is an important factor in maintaining the chain of infection of diseases which primarily affect lower animals, and which are transmitted to man as a secondary incident and in conditions in which the arthropod vectors can rarely have opportunities of becoming infected by feeding on infected persons.]

John W. D. Megaw

STEEL, M. & LAWY, H. S. **Another Case of Brill-Zinsser Disease in Britain.** *Lancet.* 1956, July 28, 174-5. [18 refs.]

In 1954 a report was published on 2 cases of acquired toxoplasmosis, the first to be recorded in Britain [this *Bulletin*, 1954, v. 51, 509]. Included in this report was a third case of illness resembling typhus fever with a macular rash which was at that time reported with some hesitation as a possible one of acquired toxoplasmosis. The reason for the present communication from Grimsby, Lincolnshire, is that this case now proves to have been one of Brill's disease. Dr. Vernon KNIGHT, of the Bellevue Hospital, New York, on reading the report of this case suspected that it was one of Brill's disease and recommended that specimens of the sera should be sent to Boston for the rickettsial complement-fixation test. Dr. MURRAY there examined these sera. His results together with the Weil-Felix titres determined in Grimsby and Colindale and the toxoplasma antibody titres in Sheffield are set out in a table. "The results of the complement-fixation tests are considered to be diagnostic. The low titres for proteus OX19 are completely compatible with the diagnosis, because Murray has shown that the Weil-Felix reaction is often negative in this condition, whereas the complement-fixation test is entirely reliable and specific."

A clinical report of the case, in an immigrant Polish woman who had been in contact with typhus during the 1914-18 war, is given in this paper and it satisfies the criteria for the clinical diagnosis of Brill's disease stated by MURRAY *et al.* [*ibid.*, 1950, v. 47, 729].

M. E. Delafield

Fox, J. P. Immunization against Epidemic Typhus. A Brief General Review and a Description of the Status of Living, Avirulent *R. prowazeki* (Strain E) as an Immunizing Agent. *Amer. J. Trop. Med. & Hyg.* 1956, May, v. 5, No. 3, 464-79. [Numerous refs.]

The first part of this paper provides a concise critical review of the literature dealing with the numerous methods of immunization against louse-borne typhus fever by killed and living vaccines consisting of *Rickettsia prowazeki*. This part is not merely of historical interest: it is an instructive example and warning of the difficulties and pitfalls which have been encountered by many of the ablest workers in the field of immunology. The greatest disappointments have beset the efforts of those who have attempted to use attenuated living vaccines made of *R. prowazeki* or *R. mooseri*; two types of the latter were very widely used in North Africa with remarkable success but when tried in other countries they caused numerous cases of severe illness and a few fatalities [this *Bulletin*, 1947, v. 44, 196]. The author concludes that the only vaccines which can safely be used are those containing killed rickettsiae "until a strain of typhus rickettsiae of demonstrably low pathogenicity for man becomes available". In the second part of this paper evidence is presented that such a strain now exists. This is strain E of *R. prowazeki* which was discovered in Spain by CLAVERO and PÉREZ GALLARDO in 1943 [this *Bulletin*, 1944, v. 41, 24]. This strain was originally virulent but during its 11th yolk-sac passage it suddenly became avirulent for laboratory animals and has remained consistently avirulent through more than 300 egg passages.

Extensive studies and trials of the living vaccine prepared from Strain E have already been described by the author and colleagues [*ibid.*, 1954, v. 51, 562; 1955, v. 52, 963, 1179]. The further investigations carried out since the publication of the last of these papers have confirmed the favourable conclusions already expressed. The number of persons inoculated under field conditions now amount to 17,000 and among these there has been no reaction amounting to a "truly serious illness". It is concluded that there is little risk of the spread of infection by lice from vaccinated persons to contacts; the rickettsiae appear to be incapable of invading the blood stream. The immunity produced by the vaccine has seemed to be superior to that resulting from a single dose of killed vaccine of the Cox type, but it is considered desirable to make a comparison with the protection afforded by a second dose of the killed vaccine. The author points out that definite proof has not been obtained

of the effectiveness of the vaccine in preventing the natural occurrence of the disease.

The bibliography is a specially valuable feature of the paper. It contains 63 references which include the full title of each article.

John W. D. Megaw

HOPPS, Hope E., HAHN, F. E., WISSEMAN, C. L., Jr., JACKSON, Elizabeth B. & SMADEL, J. E. **Metabolic Studies of Rickettsiae. III. Studies of Transamination, Oxidative Phosphorylation and Glutamate-2-C¹⁴ Incorporation by Purified Suspensions of *Rickettsia mooseri*.** *J. Bacteriology.* 1956, June, v. 71, No. 6, 708-16, 3 figs. [16 refs.]

"Crude suspensions of normal yolk sacs and of those infected with *Rickettsia mooseri* contain an active glutamic-aspartic transaminase and a weak alanine-glutamic transaminase; both enzymes are removed when the non-infected material is processed through the same steps which are employed in rickettsial purification. The process also eliminates alanine-glutamic transaminase from infected yolk sac tissue but the final preparation of purified rickettsiae contain some glutamic-aspartic transaminase.

"Purified suspensions of *R. mooseri* exhibit a low glutamic-aspartic transaminase activity which is considerably enhanced upon repeated and rapid freezing and thawing of the rickettsial suspensions. This finding is regarded as evidence for the presence of a glutamic-aspartic transaminase intrinsic to the rickettsial organisms. The enzyme did not require added pyridoxal phosphate for maximal activity; its pH activity curve, which showed maximum activity at pH 7.5, did not differ appreciably from that of the glutamic-aspartic transaminase in non-infected yolk sac preparations.

"Upon oxidation of glutamic acid the rickettsiae did not esterify demonstrable quantities of inorganic phosphate nor did they incorporate radiophosphorus from labelled orthophosphate into their insoluble constituents: likewise, they failed to incorporate radiocarbon from glutamic acid-C¹⁴ into their perchloric acid precipitable materials. The significance of these findings is discussed."

GARABEDIAN, G. A.; DJANIAN, Aida Y.; JOHNSTON, Elizabeth A. **Q Fever in Lebanon (Middle East). I. The Presence of Complement-Fixing Antibodies in Serum Samples obtained from Residents of Lebanon [GARABEDIAN, DJANIAN & JOHNSTON].** *Amer. J. Hyg.* 1956, May, v. 63, No. 3, 308-12. [16 refs.] II. Attempts to demonstrate by Animal Inoculations the Presence of *C. burnetii* in Milk Samples [GARABEDIAN & DJANIAN]. *Ibid.*, 313-18. [18 refs.]

I. Complement-fixing antibodies were found against the Nine-Mile strain of *Coxiella [Rickettsia] burnetii* at titres of 1 in 8 or over in 19·3 per cent. of the sera of 450 persons in Lebanon. The highest percentage (22·0) was found among infants up to 4 years old; in the 5 to 14 age-group the percentage was 14·0 and in the 15 and over group it was 20·4. No explanation was found for this unusual age distribution of the positive reactions. The percentages of reactions in the above age-groups at titres of 1 in 16 or over were 8·0, 6·0 and 5·6, respectively.

Among 41 persons employed as dairy workers, farmers and butchers, 16 (39 per cent.) gave positive reactions; in the other occupational groups the percentages of reactors showed no significant differences; they ranged from 14·6 to 17·4 per cent.

II. The second paper contains a description of the results of a search for possible sources of infection. Pools of milk from 177 cows, 47 sheep and 73 goats were tested by intraperitoneal inoculation of guineapigs whose sera were examined before and 38 days after inoculation.

Complement-fixation reactions at a titre of 1 in 128 developed in the guineapigs inoculated with 2 of the 11 pools of milk from cows and in 1 of the 6 pools of milk from goats, but in none of the 4 pools from sheep. The number of sheep tested was not regarded as being enough to justify the exclusion of infection among them.

Full details are given of the methods adopted in making the survey.

The results suggest that the epidemiological features of Q fever in Lebanon do not differ in any important respect from those observed in other countries of the Middle East. Conditions are said to be specially favourable for the spread of infection by the inhalation of dust contaminated by discharges from infected animals. An unusual source of infection is regarded as possible; this is the widespread consumption by the people of a mixture of raw meat and wheat as an article of diet.

Preliminary experiments have failed to determine the presence of infection in the flesh of sheep but the problem is said to need further investigation.

John W. D. Megaw

BROWN, R. D. **Serological Evidence of Q Fever Infection in Domestic Animals in Kenya.** *Bull. Epizootic Dis. of Africa.* 1956, June, v. 4, Nos. 1/2, 41-5. [24 refs.]

Complement-fixation tests with *Rickettsia burnetii* (Nine-Mile strain) antigen were carried out on sera from domestic animals in Kenya, with the following results (numerators are the numbers of sera positive at 1 in 16 or greater dilution, denominators being the total number of sera tested for each class of animal): dogs 3/4; horses 0/17; camels 4/20; goats 96/283; cattle 14/190. All sera positive against *R. burnetii* antigen were negative against epidemic typhus antigen. R. S. F. Hennessy

BRANDÃO, H.; RIBEIRO DO VALLE, L. A.; CHRISTOVÃO, D. DE A.; D'APICE, M. Investigações sobre a febre "Q" em São Paulo. I. Estudo sorológico em operários de um frigorífico [BRANDÃO, RIBEIRO DO VALLE & CHRISTOVÃO]. *Arquivos Facul. de Hig. e Saúde Pública Univ. de São Paulo.* 1953, June, v. 7, No. 1, 127-34. [23 refs.] English summary. II. Estudos em tratadores de gado e em bovinos [RIBEIRO DO VALLE, BRANDÃO, CHRISTOVÃO & D'APICE]. [**Studies on Q Fever in São Paulo, Brazil. I. Serological Study in Meat Handlers. II. Studies in Cattle Ranchers, Dairy Workers and in Cattle**] *Ibid.*, 1955, June-Dec., v. 9, Nos. 1/2, 167-80. [18 refs.] English summary.

I. In preliminary studies the authors, in São Paulo, carried out complement-fixation tests for Q fever with a commercial antigen on 473 sera from meat handlers and 170 control sera from workers in a glass factory. Eight sera from the meat handlers were positive in titres from 1 in 4 to 1 in 16 and 2 from the controls at 1 in 4 and 1 in 8 respectively.

II. In a more comprehensive study sera from cattle ranchers, dairy workers and cattle from 14 establishments were examined in complement-fixation tests with the "Nine-Mile" antigen.

Of 71 workers from 8 establishments, 5 were positive at titres of 1 in 8 to 1 in 16. No change in titre was found in the sera of 20 dairy workers in a second test 45 days later.

In cattle the principal finding was that 24 of 171 were positive in titres of 1 in 16 to 1 in 256.

Attempts were made to isolate *Rickettsia burneti* from 2 samples of blood, 1 of milk and 1 of placenta, from cows in 2 herds by intraperitoneal inoculation of guineapigs: all were negative.

Of 26 sera from recently imported cattle, 6 were positive in the complement-fixation test, 5 at 1 in 16 and 1 at 1 in 32: the cattle came from the United Kingdom and the Netherlands.

H. J. O'D. Burke-Gaffney

COLTER, J. S., BROWN, R. A., BIRD, H. H. & COX, H. R. **The Preparation of a Soluble Immunizing Antigen from Q-Fever Rickettsiae.** *J. Immunology.* 1956, Apr., v. 76, No. 4, 270-74.

The methods of preparing soluble rickettsial antigens which have been developed in connexion with epidemic and murine typhus, Rocky Mountain spotted fever, boutonneuse fever and rickettsialpox have not previously been applied to the rickettsiae of Q fever.

The authors describe experiments in which they have prepared a soluble immunizing antigen of *Coxiella* [*Rickettsia*] *burneti* from suspensions of the highly purified rickettsiae by exposing them to ultrasonic vibration.

The rickettsiae were obtained from chick yolk-sac cultures in the form of suspensions which were highly purified by differential centrifugation

and the use of washed celite [this *Bulletin*, 1952, v. 49, 134] followed by centrifugation through 8 per cent. KCl solution. In the various stages of preparation estimates of the infectivity of the suspensions were made and these showed that there was no significant loss of the rickettsiae, but there was a great reduction to about 1·0 per cent. of the total N contents originally present in the suspensions. Stained smears of the highly purified suspensions appeared to consist entirely of rickettsiae.

No attempt was made to estimate the yield of antigen from the treated suspensions and no claim is made to have achieved the most effective degree of separation of the soluble antigen from the rickettsiae.

Further study of such points as the best degree of concentration of rickettsiae, the most suitable frequency of ultrasonic vibration and period of exposure to vibration would probably result in a much more efficient separation of the soluble antigen from the rickettsiae.

The elaborate technical methods employed in this study are fully described.

John W. D. Megaw

YELLOW FEVER

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

See also p. 1390, MACDONALD, **A Mosquito Survey at Kuala Lumpur Airport with special reference to *Aedes aegypti*.**

See also p. 1311, VAN DER KUYP, **Mosquitoes of the Netherlands Antilles and their Hygienic Importance.**

See also p. 1310, LEA *et al.*, **Role of Diet in Egg Development by Mosquitoes (*Aedes aegypti*).**

WILLIAMS, M. C. **The Susceptibility of *Cercocebus albigena johnstoni* (Lydekker) to Yellow Fever.** *Ann. Trop. Med. & Parasit.* 1956, June, v. 50, No. 2, 150–51.

Although neutralizing antibodies against yellow fever virus have been found in the sera of wild *Cercocebus albigena johnstoni* (the black mangabey) [see this *Bulletin*, 1952, v. 49, 260], the capacity of monkeys of this species to infect mosquito vectors of yellow fever has been in doubt. In the work now described, the titre of circulating virus in the serum of a male *C. a. johnstoni* was determined after a subcutaneous

inoculation of $10^{1.1}$ mouse LD50 of a strain of yellow fever virus isolated in 1948 in Bwamba, Uganda, from a rhesus monkey which had been bitten by wild *Aëdes africanus*. Circulating virus was found only on the third day ($10^{0.83}$ mouse LD50 per 0.03 ml. serum), fourth day ($10^{2.5}$ mouse LD50 per 0.03 ml. serum) and fifth day (a trace). A specimen of serum taken on the 48th day protected against 400 mouse LD50. As there is evidence that *Aëdes africanus* can be infected by virus at a circulating titre of $10^{2.4}$ to $10^{2.3}$ mouse LD50 [*ibid.*, 1951, v. 48, 627], it is concluded that the monkey of the present experiment could have taken part in maintaining the virus in the wild mosquito-monkey-mosquito cycle of yellow fever.

R. S. F. Hennessey

GILLETTE, H. P. S. **Yellow Fever in Trinidad—a Brief Review.** *Mosquito News.* 1956, June, v. 16, No. 2, 121-5.

The last reported case of yellow fever in Trinidad before the outbreak of 1954 was in 1914. Attention was drawn in those earlier days to the deaths of monkeys at the time. (Both *Alouatta seniculus insulanus*, the howler monkey, and *Cebus apella*, the capuchin or white-faced monkey, occur abundantly in the forests.) Bodies of dead monkeys again were notable in the forests in the few months before the 1954 outbreak in man. *Haemagogus* [sp.?] were shown to harbour virus in the forest; these mosquitoes occur in the wooded suburbs of Port-of-Spain. Earlier, in 1948, an island-wide campaign to eradicate *Aëdes aegypti* was recommended but never implemented.

Then follows an outline of measures to control yellow fever in 1914, which included exclusion by law of non-immune persons from entering forests, clearing forest for 100 ft. from main roads, and to a 900 ft. radius from wells, as well as clearing bushy scrub, drainage, provision of screened premises, fumigation of premises and oiling stagnant waters. In 1950, a token scheme to control *A. aegypti* was begun, water containers being given a suspension of 25 per cent. wettable powder DDT at 1 drop per gallon. Full mortality was not obtained, contrary to expectation, and fresh breeding resumed 12 to 14 days later. It was not until the yellow fever outbreak of 1954 [this *Bulletin*, 1956, v. 53, 308] that island-wide efforts at control of *A. aegypti* began. In September of that year, 1 drop per gallon of water of a suspension of 75 per cent. wettable powder DDT was used. *Aëdes* indices dropped but the expected eradication was far from obtained; fresh breeding persisted. Tests in the laboratory revealed that 200 p.p.m. DDT failed to kill the larvae in 48 hours. This resistance ruled out further use of DDT and good results have now been obtained with 20 per cent. gamma BHC. *Aëdes aegypti* is expected to be cleared from Trinidad and Tobago with BHC, provided resistance does not develop.

D. S. Bertram

SEVERO, O. P. **Eradication of the *Aedes aegypti* Mosquito from the Americas.** *Mosquito News.* 1956, June, v. 16, No. 2, 115-21, 1 fig.

An account is given of the history, since 1930, of attempts to eradicate *Aedes aegypti* from the Americas and some modifications of administration introduced to simplify records but improve efficiency of treatment and checking. Bolivia and French Guiana were free of the mosquito in 1948 and 1952, respectively. Final stages of eradication are in progress in Chile, Ecuador, British Guiana, Paraguay, Peru and Uruguay. Work is in progress in Colombia and Venezuela and is being organized for Argentina. Nothing has yet begun in Surinam. In Central America final phases or final checks of eradication are in progress in Panama, Nicaragua, Costa Rica, Honduras, and British Honduras, El Salvador and Guatemala. The Panama Canal Zone is believed to be free of the mosquito. Good results are reported now for Puerto Rico but in the Antilles Islands and Trinidad, Tobago and elsewhere forceful efforts have just begun. An outbreak of yellow fever in Port-of-Spain, Trinidad, in 1954 [above] emphasizes the need in the islands. In Mexico a good deal of territory is still infested but a malaria-eradication campaign with DDT applications may help to improve this position. The author is adviser to the *Aedes aegypti* Eradication Project of the Pan-American Sanitary Bureau. He concludes with a strong appeal that the United States of America, which has not begun an eradication campaign for *Aedes aegypti* despite extensive areas of infestation recognized as potential yellow fever areas, should change her policy and take action.

D. S. Bertram

DENGUE AND ALLIED FEVERS

ROSS, R. W. **The Newala Epidemic. III. The Virus: Isolation, Pathogenic Properties and Relationship to the Epidemic.** *J. Hygiene.* 1956, June, v. 54, No. 2, 177-91.

During investigations of the disease ("Chikungunya") clinically resembling dengue which affected the Newala district of Tanganyika in 1952-1953 [see this *Bulletin*, 1955, v. 52, 442], attempts were made to isolate virus from human sera, wild mosquitoes, bed bugs, and laboratory-bred *Aedes aegypti* which had fed on patients. The results of intracerebral inoculations in young mice indicated that 2 pathogenic agents with different incubation periods were present in certain sera and mosquitoes. A transmissible pathogenic agent [not described] was detected by mouse inoculation in 3 out of 17 bed bugs from the beds of patients recently suffering from the disease. On re-testing stored material, 4 "short

incubation" strains of a virus lethal for baby mice on intracerebral inoculation were isolated, 2 from sera, 1 from a mosquito (*Aëdes aegypti*) fed on a patient, and 1 from a pool of wild *Aëdes aegypti*. All 4 strains were glycerin-resistant and could be passaged readily in dilute brain suspensions, with the regular production of "characteristic symptoms" (falling when disturbed, with extension of limbs and head, and coarse spasmoidic tremor), often on the 2nd day. Infectivity titres of stored mouse-brain suspensions in 6-day-old mice varied between $10^{-6.8}$ and 10^{-8} , the median death being on the 4th day; only occasional deaths occurred in 28-day-old mice. An antiserum prepared against one strain neutralized over 10,000 LD₅₀ of all 4 strains, which were designated "Chikungunya virus".

In contrast to these strains with a short incubation period, several "long incubation" strains of virus were also isolated from sera and mosquitoes. Strains which regularly killed mice older than 14 days were readily distinguishable from Chikungunya virus by cross-immunization tests. They appeared identical, and the virus was called "Makonde virus". Cross-neutralization tests suggested a probable relationship between Chikungunya and Hawaiian dengue viruses, but none between Makonde, Chikungunya, New Guinea "B" dengue and Sindbis viruses. Neutralizing antibodies for Chikungunya virus were found in the sera of human convalescents and persons who had experienced the disease several months previously. It is believed that the Chikungunya virus is associated with the human disease and that it is probably a type of dengue. The significance of Makonde virus is not clear.

R. S. F. Hennessey

Ross, R. W. **A Laboratory Technique for Studying the Insect Transmission of Animal Viruses, employing a Bat-Wing Membrane, demonstrated with Two African Viruses.** *J. Hygiene.* 1956, June, v. 54, No. 2, 192-200, 2 text figs. & 1 fig. on pl.

Laboratory-bred *Aëdes aegypti* were infected with Chikungunya and Makonde viruses [see above] by feeding on mouse-brain suspensions in tubes sealed with pieces of wing membrane from freshly killed wild bats "of several species", the tubes being kept in a water jacket at 40°C. during presentation to individual mosquitoes. After appropriate incubation, the mosquitoes were applied to similarly-sealed tubes each containing 0.5 ml. of warmed "normal serum and 1% blood cells"; when an insect had finished probing or engorging the fluid was used for mouse inoculation. By this method 6 out of 24 infected mosquitoes were shown to have transmitted Chikungunya virus by bite. Transmission of Makonde virus by bite was achieved once only, by 1 mosquito out of 33 tested.

It is considered that the membrane technique is of use for infecting mosquitoes by bite and for producing infection in relatively insusceptible animals, which can be inoculated by the most favourable route with

material emitted by mosquitoes. Measurement of the inoculum emitted by a single mosquito is simplified.

R. S. F. Hennessey

RABIES

NIKOLITSCH, M. Tollwutfall bei einem Menschen verursacht durch Gänsebiss. [A Case of Rabies in Man caused by the Bite of a Goose] *Arch. f. Hyg. u. Bakt.* 1956, June, v. 140, No. 4, 272-5.

Although rabies infection in birds is known to occur, no record of human infection by the bite of a bird was found by the author of the present paper in a search of the literature, with the possible exception of 1 case mentioned in a book published in 1641 as due to infection from a cock. A clinical account is given here of the illness of a Serbian boy aged 9 years who died the day after he was admitted to hospital. Rabies was diagnosed but there were no post-mortem or histological and biological examinations. Enquiry ultimately revealed that the boy had been bitten in the face by a goose about 20 days before his illness began. Foxes had on several occasions done damage among the geese and the goose which had bitten the boy was ultimately carried off by a fox but was rescued by dogs only to be devoured by them. Since rabies infection is known to be frequent in the domestic animals and also to be present in the foxes of the neighbourhood, the evidence suggests that the goose in question may have been infected by the foxes. The problem of the action that should be taken when a human being is injured by a bird is discussed. The author holds the view that any individual bitten by a bird which cannot be satisfactorily examined should be given a complete course of anti-rabies inoculations.

M. E. Delafield

PLAQUE

BRYGOO, E. R. & CREFF, P. Aspects de l'épidémiologie de la peste dans le canton de Bealanana, province de Majunga. [Observations on the Epidemiology of Plague in the Bealanana Canton, Madagascar] *Arch. Inst. Pasteur de Madagascar.* 1955, 20-28.

This is an account of conditions relating to human plague in the Bealanana canton of Madagascar, sporadic cases of the disease having occurred in this canton since 1948. [The total for 1948-1955 inclusive seems to be 54 cases.] The attack rate has been high among males and

children. Many infections were probably contracted in temporary shelters (*toby*) used by workers in ricefields; these shelters are rat-attractive, providing good opportunities for transfer of plague to human beings. Children play an important part in protecting the rice crop, and spend much time in the *toby*. Information concerning plague in field rodents is lacking, although murine epizootics are said to have preceded human infections on 4 occasions in recent years. Disinsectization with DDT and mass immunization with EV plague vaccine are the chief control measures. It is considered that plague in this canton presents the same problems as are encountered in the highlands of Madagascar [this *Bulletin*, 1940, v. 37, 829], where prophylactic action has reduced the risk of epidemic spread but where eradication cannot be envisaged because of ignorance concerning the mode of survival of the infection between acute outbreaks.

R. S. F. Hennessey

LINK, V. B. A History of Plague in the United States of America.

Pub. Health Service Publication No. 392. Pub. Health Monograph No. 26. Wash. 1955, Mar., pp. viii + 120, numerous figs. [Numerous refs.]

This monograph gives an interesting account of the course of plague in the United States since 1899, when the disease was first recorded there. Within a few months of the recognition of the infection in persons arriving by sea, who had contracted it on board ship, plague broke out in San Francisco. Since then, the disease has appeared in 12 States, and 523 cases with 340 deaths occurred during the period 1900–51. But as Dr. Theodore J. BAUER says in a foreword, the potential danger and the amount of money spent on suppressive measures over the past 50 years remove plague from a minor classification where the United States is concerned. The monograph devotes separate chapters to each of the major outbreaks, with concise descriptions of events and control operations. There are also chapters on plague in wild animals and on modern methods of prophylaxis and treatment. The style is quiet and factual, and the text and appendices contain an adequate amount of quantitative data; these include records of cases, summaries of biological investigations, and statements relating to expenditure, staff, materials used, and so on. A number of photographs illustrate the background and working methods. Between 1924 and 1951 only 30 cases of human plague were recorded; while this decrease in incidence has to be viewed against the recession of the latest pandemic, credit for the containment of the disease during its active phases must go to the workers of the Public Health Service and State health departments whose labours are so ably summarized here. Those concerned with plague will find much to interest them in Dr. Link's chronicle of a half-century's experience in the United States.

R. S. F. Hennessey

See also p. 1325, WOODWARD, **Clues to better understanding of the Nature and Treatment of Certain Infectious Diseases.**

BALTAZARD, M., DAVIS, D. H. S., DEVIGNAT, R., GIRARD, G., GOHAR, M. A., KARTMAN, L., MEYER, K. F., PARKER, M. T., POLLITZER, R., PRINCE, F. M., QUAN, S. F. & WAGLE, P. **Recommended Laboratory Methods for the Diagnosis of Plague.** *Bull. World Health Organization.* Geneva. 1956, v. 14, No. 3, 457-509. [57 refs.]

Laboratory methods differ from place to place, and the task of sifting, selecting and aligning the material supplied by the 12 joint authors of this paper in response to "a very detailed questionnaire" cannot have been an easy one. Remembering this, and the varying degrees of experience of workers who may be called upon to play a part in plague diagnosis, a useful attempt has been made to collate and describe a number of practical procedures for the isolation and identification of the plague bacillus. There are sections on general methods, including staining, cultivation, biochemical tests, serological tests and animal experiments; on the laboratory diagnosis of rodent plague, of plague in fleas or other insect vectors, and of plague in patients; on methods of examination of plague-suspect dead bodies; and on precautions against infection. Descriptions of techniques are mostly lucid and realistic, but it is not always clear which of alternative methods is actually recommended; for instance, both plain agar and blood agar media are mentioned as suitable for diagnostic work, without comment on their respective merits. Again, the paragraph on Gram staining gives 4 modifications of Gram's staining method "which are now used in some of the leading laboratories" and ends as follows: "*Recommended method:* Modifications (b) or (d) are preferable for workers not familiar with another modification of Gram's staining method". This cryptic advice raises doubts as to whether a worker who is so innocent as to require instruction on Gram staining is fit to concern himself with plague diagnosis. Apart from this, the section on general methods contains much useful material, especially the sub-section on biochemical methods. One may perhaps question the value of the paragraphs on phage identification tests and haemagglutination tests; a worker who has not had previous experience of these special procedures would find it hard to apply successfully the methods outlined here.

The sections on rodent plague and the examination of insect vectors are most practical, but that on the laboratory diagnosis of plague in patients is somewhat obscured by reservations. Thus, it is stated that "Laboratory examination of the bubo contents withdrawn by puncture during the early stages of the disease is . . . a method of paramount diagnostic importance", but later that "this method of examination is rather undesirable on account of the great pain which it usually causes".

The authors go on to say that bubo puncture should be used exclusively in cases of particular diagnostic importance, namely, (1) in early or sporadic cases and (2) in atypical cases. This raises the question whether or not it is of diagnostic importance to confirm a clinical suspicion of bubonic plague, irrespective of the presence of an outbreak, by the laboratory examination of material from the bubo.

The section on precautions is plainly and helpfully constructed, although one cannot help wondering whether all workers outside the tropics will take kindly to the advice that they should protect themselves by wearing a special costume which "consists principally of a gown similar to that used by clowns".

R. S. F. Hennessey

THAL, E. Relations immunologiques entre *Pasteurella pestis* et *Pasteurella pseudotuberculosis*. [Immunological Relationships between *Pasteurella pestis* and *P. pseudotuberculosis*] *Ann. Inst. Pasteur*. 1956, July, v. 91, No. 1, 68-74. [17 refs.]

Having remarked that guineapigs inoculated with an avirulent strain of *Pasteurella pseudotuberculosis* were resistant to virulent strains with heterologous O and H antigens, the author inferred that this immunity was due to the R antigen common to all these strains. As the R antigen is also present in *Pasteurella pestis*, the ability of an avirulent strain of *P. pseudotuberculosis* to protect against *P. pestis* was examined. An experiment showed that cross-protection did in fact occur, 10 out of 10 guineapigs injected with the avirulent 32/IV strain of *P. pseudotuberculosis* surviving intraperitoneal challenge with 760,000 virulent plague bacilli. In cross-precipitation studies, the antibody produced against the water-soluble protein fraction IB of *P. pestis* [see this *Bulletin*, 1952, v. 49, 616] reacted with extracts of strains of the 5 O groups of *P. pseudotuberculosis*, and could be removed by absorption with either *P. pseudotuberculosis* or *P. pestis* R strains. "It is suggested that the immunochemically common factor is responsible for the immunity induced." R. S. F. Hennessey

BRYGOO, E. R. Action de la spiramycine sur *Pasteurella pestis*, *Pasteurella septica*, *Cilopasteurella pseudotuberculosis*. [Action of Spiramycin on *Pasteurella pestis*, *P. septica* and *P. pseudotuberculosis*] *Arch. Inst. Pasteur de Madagascar*. 1955, 29-32.

The bacteriostatic activity of Spiramycin was tested against *Pasteurella pestis*, *P. septica* and *P. pseudotuberculosis*. It was necessary to use 2 mgm. of Spiramycin on paper discs in order to produce regular inhibition of *P. pestis* and *P. pseudotuberculosis* on agar; in the case of *P. septica*, inhibition was obtained with 200 µgm. In liquid medium the bacteriostatic concentration lay between 10 mgm. and 1 mgm./ml. for *P. pestis*, between 1 mgm. and 100 µgm./ml. for *P. pseudotuberculosis*, and between

100 μ gm. and 10 μ gm. for *P. septica*. No antibiotic activity was detected in mice treated with 100 mgm./kgm. of Spiramycin daily for 3 days after inoculation with 5 LD50 of *P. pestis* or 50 LD50 of *P. septica*.

R. S. F. Hennessey

CHOLERA

PENNANÉAC'H, J. Un centenaire: le choléra nautique de la mer Noire (1854-1856). Étude épidémiologique. [A Centenary. Cholera in the Black Sea, 1854-1856. Epidemiological Study] *Rev. Méd. Nav. (Métropole et Outre-Mer)*. Paris. 1956, v. 11, No. 2, 177-201, 1 map & 1 fig. on pl. [10 refs.]

CHUGH, M. L., JENSEN, K. E. & KENDRICK, Pearl L. Antigenic Relationships and Toxicity of Mucinolytic Preparations from *Vibrio comma* and Related Vibrios. *J. Bacteriology*. 1956, June, v. 71, No. 6, 722-7. [12 refs.]

"Evidence has been presented which indicates that ovomucinases produced by strains of vibrios can be antigenically differentiated. Active preparations from the 12 strains studied comprise three different groups. A previously undescribed toxic activity of vibrios has been found in fractions containing mucinolytic activity. Further work is required to determine the precise relationship between mucinolytic and toxic activities, and whether they are involved in the production of the disease cholera and, most importantly, if these factors are of significance in the immunology of cholera."

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

KEAN, B. H., GILMORE, H. R., Jr. & VAN STONE, W. W. Fatal Amebiasis: Report of 148 Fatal Cases from the Armed Forces Institutes of Pathology. *Ann. Intern. Med.* 1956, May, v. 44, No. 5, 831-43. [29 refs.]

From 1862 to 1953, 290 fatal cases of amoebiasis were registered at the U.S. Armed Forces Institutes of Pathology. During this period over

500,000 pathological specimens were registered. Of the 290 cases, 203 had records possessing sufficient clinical and pathological data for analysis. In 14 no definite cause of death was established and in 41 others amoebiasis was not primarily responsible for death, but was discovered incidentally. The remaining 148 comprise the subject of this report. Amoebae were demonstrated in all cases, either in the intestines or liver at autopsy, or ante mortem in the faeces or by liver aspiration.

The ratio is given of the average number of fatal cases to the average number of active personnel in the Armed Forces (per million). The incidence of amoebic deaths has been low and relatively constant since 1917. Of the 148 patients described in this report 138 were males and 10 were females. One case involving a 7½-month-old female child is of interest as this disease is so seldom reported in infants. Multiple ulcers were found in colon and rectum.

Almost 9 times as many cases were contracted in the Far East as in Europe. Four-fifths of the patients died within 6 months of their first reported symptoms and 20 per cent. of these within 2 weeks of the onset.

Amoebiasis was diagnosed correctly in 36 per cent. of the 133 in which a clinical diagnosis was recorded. Liver disease was suspected in 84 per cent. in those in whom amoebic liver abscess led directly to death. Carcinoma of the bowel was given as the wrong diagnosis in 6 and appendicitis only in 5.

As regards the specific cause of death, 54 per cent. died of intestinal complications, 21 per cent. of liver disease, 11·5 per cent. with fatal lung involvement and 7 per cent. as aftermath of surgical intervention. In 2 with brain abscess the amoebic aetiology was definitely established. Four died of heart failure (2 with amoebic pericarditis) and 2 with myocarditis probably from emetine toxicity. Perforation of intestine was the most common cause of death and peritonitis from all causes was fatal in 51 per cent. Jaundice was noted in approximately 14 per cent. of both those patients with liver abscess and those without. The entire colon was involved in almost half those with intestinal lesions—in decreasing order of frequency were the caecum, caecum and ascending colon, rectosigmoid, caecum and terminal ileum, ascending colon, transverse and descending colons. The terminal ileum was involved in 7. This distribution is in harmony with the large series described by CLARK in 1925 [see this *Bulletin*, 1925, v. 22, 730]. Intestinal perforation was found 59 times; the most frequent site was the caecum. Only 2 cases of appendix rupture were noted. There were 18 (12·2 per cent.) in which there were no detectable lesions in the intestine. *E. histolytica* was demonstrated in sections at autopsy in one-third of the cases. In a large number of those which were "histologically sterile" large amounts of specific therapy had been given. Of the 90 cases of liver abscess 40 per cent. had a single abscess in the right lobe and 27 per cent. had multiple abscesses throughout all lobes. Of 41 liver abscesses which ruptured 22 extended into the lung and 10 into the abdominal

cavity, 5 under the diaphragm, 2 into the pericardium, and 1 each in kidney and pancreas. Amoebae were found histologically in 60 per cent. of 88 cases.

There was no correlation, case for case, between the location of the intestinal lesion and the position of the liver abscess. There were 18 instances where liver abscess was present entirely without any visible intestinal lesions. If 2,000 gm. is taken as the upper limit of the weight of the normal liver, there were, out of 100 weighed, 52 of normal size and 48 enlarged (10 without and 38 with abscesses). *Philip Manson-Bahr*

BIEL, F., SCHIAPPACASSE, E., CABRERA, M., RABAH, A. & OLMO, A.
Rectosigmoiditis amebiana. Relación clínico endoscópica. [Amoebic
Rectosigmoiditis Relation between Clinical and Endoscopic Findings]
Rev. Med. Chile. 1955, May, v. 83, No. 5, 269-73. [16 refs.]

A study of 91 cases.

SONG, Yo Seup. **Cutaneous Amebiasis: Report of Two Cases with One Autopsy.** *Ann. Intern. Med.* 1956, June, v. 44, No. 6, 1211-18,
4 figs.

"Two cases of cutaneous amebiasis, including one with necropsy, are presented. Although skin involvement was the chief complaint of the patients, and the *E. histolytica* were found only in the skin, we feel that in both the skin lesions had arisen by contiguity with the infected colon.

"The lack of organisms in the autopsy material of the first case, the clinical improvement in both cases, and the marked proliferation of granulation tissue suggest a definite benefit from combined Aureomycin and emetine or chloroquine therapy.

"The literature on amebic infection of the skin is briefly reviewed."

LYNCH, J. E., BAMFORTH, Bobbe J. & GOECKERITZ, Dorothy. **The Laboratory Evaluation of Antiamebic Activity. The Comparative Results obtained by the Use of *in Vitro* and *in Vivo* Methods.** *Antibiotics & Chemotherapy.* New York. 1956, May, v. 6, No. 5, 330-36.
[22 refs.]

Tests of anti-amoebic activity may be made *in vitro*, when it is sometimes difficult to distinguish between a direct effect on the amoebae themselves and one on the bacteria which must accompany them in culture, or by the treatment of experimental amoebiasis in various animals. This paper reports some tests of both kinds, those *in vivo* being carried out in both guineapigs and young rats infected by intracaecal inoculation. Of the 8 drugs tested, 4 were highly active *in vitro*: these were anisomycin, emetine, fumagillin and Win 5047. When these 4 were tested in animals, the first 3 were highly active therapeutically and

almost equally so in both species, and Win 5047, which was much less effective, also gave similar results in both species of animal. Carbo-mycin, erythromycin, tetracycline and oxytetracycline had very low *in vitro* activity, and a poor therapeutic action in guineapigs, but were very much more effective in rats. It is pointed out that these drugs have also been shown to possess anti-amoebic activity in man. It is concluded that for the evaluation of possible usefulness in amoebiasis a drug should be tested in at least 2 animal species, since the results in only one may be misleading.

L. P. Garrod

THOMPSON, P. E., McCARTHY, D. A., BAYLES, Anita, REINERTSON, J. W. & COOK, Alice R. **Comparative Effects of Various Antibiotics against *Endamoeba histolytica* in Vitro and in Experimental Animals. Antibiotics & Chemotherapy.** New York. 1956, May, v. 6, No. 5, 387-50. [39 refs.]

Twenty antibiotics were tested for anti-amoebic activity *in vitro* and 22 *in vivo* (including in each case 3 forms of chloramphenicol). Three kinds of *in vivo* test were used; rats were inoculated intracaeally, dogs per rectum and hamsters intrahepatically (only 6 antibiotics were tried in the treatment of hamsters, and the results were not encouraging). The infection in rats "proved to be overly sensitive to antibacterial drugs", and the authors evidently distrust findings in this animal: they believe that those in dogs correspond most closely to those to be expected in man.

It is impossible to summarize the results of so extensive a series of tests. The authors' own judgment of them is as follows:—"Actidione, fumagillin, prodigiosin and streptothricin are very effective *in vitro* and/or against intestinal amebiasis; however, toxicity considerations virtually preclude all but fumagillin for human use. Azaserine is not sufficiently active to be promising. Anisomycin and puromycin are comparatively effective but may be of limited use owing to toxicity. Bacitracin, carbo-mycin, chloramphenicol, dihydrostreptomycin, neomycin, PA 105, penicillin G, streptomycin, and tetracycline have low activity; however, this, coupled with low oral toxicity, favors their use as adjuncts to more potent, specific amebicides. Chlortetracycline, oxytetracycline, viridogrisein, and, possibly, erythromycin stearate, although not highly potent on a weight basis, exhibit favorable relationships between activity and oral toxicity".

L. P. Garrod

BURROWS, R. B. & SWERDLOW, M. A. ***Enterobius vermicularis* as a Probable Vector of *Dientamoeba fragilis*.** Amer. J. Trop. Med. & Hyg. 1956, Mar., v. 5, No. 2, 258-65, 2 figs. [20 refs.]

DOBELL [see this *Bulletin*, 1941, v. 38, 422] was the first to suggest that *Dientamoeba fragilis* might be an aberrant flagellate transmitted, like blackhead in turkeys, by the egg of a nematode worm. The present

authors present the first evidence in confirmation of this hypothesis; they noticed that there was an abnormally high association between the incidence of this protozoon and of *Enterobius vermicularis* in appendices of U.S. service personnel and their families in California [see also this *Bulletin*, 1956, v. 53, 890]. Of 22 appendices harbouring *D. fragilis*, 12 were also infected with the pinworm, an association 20 times greater than the theoretical incidence (the incidence of the worm in 1,518 appendices being 2·9 per cent. and of the protozoon 1·45 per cent.). Sections were made of a formalin-fixed appendix containing both parasites, and small bodies less than 5 μ in diameter were found in about 30 per cent. of the unsegmented eggs, either singly or as many as three together. The bodies were amoeboid with a single nucleus consisting of a ring of chromatin and resembling the nucleus of *D. fragilis* as seen in formalin-fixed appendices except that it was not double. Six worms, from patients in whom *D. fragilis* had not been found, were sectioned and no similar bodies were discovered in the eggs; nor were they found in other positive material. Cultures and animal experiments with *Enterobius* eggs from *D. fragilis* cases have so far proved negative.

One of the authors himself contracted an infection of *D. fragilis*, symptoms (abdominal discomfort accompanied by mushy stools) arising 8 days after handling an anal swab infected with pinworm eggs. The protozoal infection continued for some weeks, the density of parasites rising and falling in weekly cycles, and on the eleventh day of the disease pinworm eggs were also discovered.

[The photomicrographs and line drawings which illustrate this interesting paper are not very convincing, but it should be remembered that histological evidence of the passage of *Histomonas meleagridis* through *Heterakis* is still unsatisfactory though the method of transmission itself is fully confirmed in blackhead; it may be therefore a long time before the actual passage of *Dientamocba* through the ova is properly demonstrated, though it should be possible by experiments on human volunteers to confirm the important observations here presented.] P. C. C. Garnham

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

ROLLIER, R., CHRAIBI, L. & LAYS, Y. Le problème actuel de la lèpre au Maroc. [**The Present Leprosy Problem in Morocco**] *Maroc Méd.* 1956, June, v. 35, No. 373, 582–90, 1 map. [95 refs.]

After giving a brief sketch of leprosy in Morocco in the past [see also this *Bulletin*, 1951, v. 48 (995)] the authors show by means of curves how

the registered number of patients suffering from leprosy in Rabat has risen and fallen during the years from 1925 to 1955. In 1925 the number was 302, in 1928 it was 139, in 1930 it rose again to 327 and by 1936 to 544. By 1944 it had fallen to 125, but rose again by 1954 to 580. This fluctuation was due to the popularity of the treatment available at the time. The authors calculate that among the Moslem population there are about 10,000 suffering from leprosy (about 1 per 1,000); among the Jewish and European population the rate is about 1 per 10,000. Of the known cases at present the percentages according to race are Moslems 91·6, Jews 6·4, and Europeans 2. The difficulties in controlling leprosy in Morocco are finance, the absence of special clinics outside of Casablanca, and the negligence and fatalism of the patients which make regular treatment impossible.

Ernest Muir

MONTESTRUC, E. De la lèpre à la Martinique. [Leprosy in Martinique]
Biol. Méd. 1956, May-June, v. 45, No. 3, 247-343, 2 figs. [Refs. in footnotes.]

Leprosy was unknown on this Caribbean island till its first mention in 1751. From then on the history is traced. A systematic survey was not made till 1933. For a time patients were lodged in a leprosarium at Désirade, but this place was not at all popular and was an obstacle to gathering patients for treatment. In 1948, when Martinique, Guadeloupe, Réunion and Guiana became *Départements* of France, a more liberal policy was adopted, and pavilions attached to the hospital at Fort-de-France were erected, sufficient to hold 120 patients. During the years 1934 to 1954 the annual numbers of patients registered rose from 66 to 196, making a total for these 21 years of 1,648. From 1948 to 1954 the 821 patients registered were classified as 28·3 per cent. lepromatous, 15·9 per cent. tuberculoid, and 55·7 per cent. indeterminate. As to ages, during the longer period of 21 years, 29 per cent. of patients were under 15, and 53·1 were less than 25, when registered. As regards familial infection, out of the last 100 patients registered 51 were brothers and sisters, 18 had maternal infection and 14 paternal, 9 were infected by uncles or aunts, 7 were cousins, and there was 1 conjugal infection.

It is calculated that in 1954 as many as 700 to 800 patients received ambulatory treatment in dispensaries or from private doctors. About 150 were treated in the special hospital wards. Unfortunately 50 per cent. of these beds are blocked with incurables, instead of being used for short periods for patients needing temporary treatment.

In spite of sulphone treatment, the disease seems to be increasing rather than diminishing, largely because patients take treatment irregularly. This is shown by the fact that in 1954, 196 new patients were registered, of whom 45 were lepromatous, 29 tuberculoid and 122 indeterminate, a total number three times that of 20 years ago. The article

compares the leprosy epidemic to that of poliomyelitis; although the latter is receiving abundant attention, leprosy is being comparatively neglected. It finishes with a programme considered indispensable for the elimination of leprosy in the years to come.

Ernest Muir

GEHR, E. **The Mitsuda Reaction with the Dharmendra Antigen in Various Groups of Healthy Persons in Surinam.** *Internat. J. Leprosy.* New Orleans. 1955, Oct.-Dec., v. 23, No. 4, Pt. 1, 393-9, 1 fig.

In all 1,499 persons were tested with Dharmendra's antigen. These are divided into 8 different racial groups. The positive reactions in non-leprosus people are numbered as percentages as follows in these groups: medical and nursing staff working at leprosy clinic and leprosarium 94, Creole contacts 64, Creoles in coastal zone 49, Creoles in mental hospital (all adults) 59, East Indians (descendants of immigrants from India and Pakistan) 21, Indonesians 25, Bush Negroes 70, and American Indians 26. The remarkable feature is the comparatively large percentages of positive reactions among Bush Negroes among whom known leprosy is uncommon compared with that among the Creoles. Tuberculosis is not likely to be the cause as it is uncommon among the Bush Negroes, who live at a long distance from the town. [For previous studies, see this *Bulletin*, 1954, v. 51, 1255.]

Ernest Muir

LARA, C. B. & TIONG, J. O. **The Problem of the Negative Inmates in the Culion Sanitarium.** *Internat. J. Leprosy.* New Orleans. 1955, Oct.-Dec., v. 23, No. 4, Pt. 1, 361-9.

Recent investigation showed that of the patients in the sanatorium 440 (about 25 per cent.) had been clear of infection sufficiently long to allow them safely to return to the community. These are divided into two groups:—adults brought from different parts of the country (268) and those born in the institution (172).

Of the first category 80 per cent. are unwilling to go home. Of the latter category many would like to be discharged, but they have no relatives to whom they could be sent. Of the first class of 268 there are 171 with deformities, 91 of them being males. Of these males 61 per cent. would be able to support themselves without Government help, and the same proportion of female patients with deformities would similarly be able to do so. Almost all those without deformities would be able to support themselves.

Out of the 1,700 inmates in the sanatorium only about 40 per cent. were taking treatment, some complaining of unconfirmable subjective symptoms and others unwilling to become negative for fear of being discharged from the sanatorium where they have security and a Government

allowance. Of the 172 born in Culion 44 were orphans and, with the exception of one girl who had taken diasone, all had recovered from leprosy spontaneously with only very rarely a tendency to relapse, thus showing high resistance. Of those born in Culion and who were of age almost all would be able to earn their living.

The following recommendations are made to provide for the immediate and eventual relief of the inmates: an experienced and sympathetic social worker to maintain liaison with relatives at home; means to secure the property of inmates; means to improve the crops and livestock of the inmates; better education; security of land tenure. Lastly, apprehension is expressed at the danger of many negative persons remaining in the sanatorium, with unrestricted opportunity to marry with the patients, which would eventually lead to a large number of births and infection of fresh generations of children.

Ernest Muir

FITE, G. L. & WADE, H. W. **The Contribution of Neisser to the Establishment of the Hansen Bacillus as the Etiologic Agent of Leprosy and the So-Called Hansen-Neisser Controversy.** *Internat. J. Leprosy.* New Orleans. 1955, Oct.-Dec., v. 23, No. 4, Pt. 1, 418-28.

A review is made of the known facts about Albert Neisser's participation in the discovery of the bacillus and its establishment as the cause of the lesions of leprosy. In 1874 Hansen observed and described the bacillus; but his observation was very defective and he was unable to convince others, including Danielssen his chief, as he had not at that time the technique and the stains necessary for showing the bacillus clearly. In 1879 Neisser went to Bergen and obtained material from Hansen and applied new methods of staining according to Koch's technique, which showed up the bacilli clearly. Thus Neisser confirmed and expanded the work of Hansen. Meanwhile Hansen had also obtained the later staining methods from Koch, but was slower than Neisser in publishing the results. Neisser was a bacteriologist, but Hansen was a leprologist and did far more for the campaign against leprosy than discovering the aetiological agent.

Ernest Muir

CHATTERJEE, K. R., DAS GUPTA, N. N. & DE, M. L. **Observations on the Morphology of *Mycobacterium leprae* by Ordinary Optics, Phase Microscopy, and Electron Microscopy.** *Internat. J. Leprosy.* New Orleans. 1955, Oct.-Dec., v. 23, No. 4, Pt. 1, 385-92, 28 figs. on 2 pls.

Material for examination was obtained from untreated active disease by trituration of fat-free biopsy material in physiological saline, and centrifugation. The material for the electron microscopy was fixed with osmic acid vapour, 2 per cent., for 10 minutes. The living bacilli were examined by phase microscopy. Comparable forms were found by all 3

methods: a short oval type of cell with 1 or 2 polar condensations; elongated types with double polar condensations; very long types with alternate light and dark zones; homogeneously dark elongated types. "From the study of these different variants it seems to us that there possibly exist two phases of the growth cycle—a slow phase of multiplication resulting in solid, homogeneously dense forms, and a rapid phase resulting in forms possessing alternate light and dark regions."

The various forms seen are illustrated by photomicrographs.

Ernest Muir

Gözsý, B. & Kátó, L. Studies on the Effects of Phagocytic Stimulation on Microbial Disease. XI. Action of Chaulmoogra Derivatives on Endothelial Cells of Skin Vessels. *Internat. J. Leprosy.* New Orleans. 1955, Oct.-Dec., v. 23, No. 4, Pt. 1, 406-12, 1 fig. on pl. [10 refs.]

With a view to studying the effect of chaulmoogra oil on the cellular defence mechanism in leprosy the following experiments were carried out. Twelve different substances including histamine bihydrochloride, chaulmoogra oil and 9 chaulmoogra derivatives were applied to the depilated abdomens of white mice. The histamine was applied in a 0.5 solution in 70 per cent. ethyl alcohol, and the chaulmoogra and derivatives in linseed oil. Immediately after the applications (each preparation to 4 mice) 0.5 cc. of india ink mixture was injected intravenously in the tail of each animal. The degree of phagocytic activity was assessed by the degree of pigmentation of the skin. This was read after 2 and 24 hours and compared with a control of linseed oil alone, degrees of pigmentation being marked from zero up to 4 plus. The chaulmoogrates of sodium, magnesium and barium and the control gave negative results. The histamine salt gave 4 plus as did chaulmoogra oil (20 per cent.) and its various esters, after 24 hours. Histamine, 20 per cent. chaulmoogra and its 1 per cent. benzyl ester gave 4 plus at the 2-hour reading. "This similarity of action of both histamine and chaulmoogra derivatives on the endothelial cells of skin vessels, and the fact that for both cases the induced phagocytosis could be inhibited by an antihistaminic, permits us to suppose that this action on the part of the chaulmoogra derivatives is brought about as a consequence of the liberation of histamine. However, this hypothesis remains to be proved by direct quantitative methods."

Ernest Muir

Kátó, L. & Gözsý, B. Studies on the Effects of Phagocytic Stimulation on Microbial Disease. XII. Action of Chaulmoogra Oil on the Reticuloendothelial System. *Internat. J. Leprosy.* New Orleans. 1955, Oct.-Dec., v. 23, No. 4, Pt. 1, 413-17, 2 figs.

Following on the evidence in the last-described experiments that chaulmoogra derivatives acting like histamine stimulate the activity of

endothelial cells in the skin, a further trial was made to find out whether chaulmoogra derivatives also resembled histamine in accelerating the disappearance from the body of india ink injected into the vein.

Out of 250 albino rats 50 were injected with histamine subcutaneously, 50 with Benadryl, and 50 on 2 occasions with chaulmoogra oil. India ink suspension was injected intravenously in the first 2 groups 30 minutes after the previous injection, and in the third 1 hour after the second chaulmoogra injection. Controls consisted of 100 rats which were given only the solvents before the injection of the india ink. The ink disappeared in the controls within 39 to 68 minutes. The disappearance was delayed in the antihistamine group and accelerated in the histamine and chaulmoogra groups. This gives further evidence that chaulmoogra acts in leprosy by stimulating the cellular defence mechanism of the host to increased activity.

Ernest Muir

TARABINI-CASTELLANI, G. Síndrome nefrótico en lepra; la disproteinemia. [Nephrotic Syndrome in Leprosy; Dysproteinæmia] *Internat. J. Leprosy.* New Orleans. 1955, Oct.-Dec., v. 23, No. 4, Pt. 1, 400-405.

The author studied the blood protein in 10 nephrotic cases of lepromatous leprosy. In proportion to the advance of leprosy he found a decrease in the total proteins. The albumin fraction was always decreased, but if this loss is compensated by an increase of total proteins then function is maintained and the prognosis is not so bad. The alpha 1 and beta globulins almost always increased, but irregularly, and the gamma globulin always increased. The same blood protein picture was found in lepromatous cases without renal symptoms, and it is therefore concluded that it is not proteinuria which causes it, but leprosy. Ernest Muir

MOSTERT, H. v. R. **The Classification of Leprosy (an Historical Survey of the Problem with Comments on the Recent System proposed at Madrid).** *Central African J. of Med.* 1956, June, v. 2, No. 6, 225-33, 9 figs. [12 refs.]

This is a clearly written and well illustrated article, particularly suitable for helping the general medical practitioner to recognize the abstruse divisions and subdivisions under which leprosy is classified. The historical survey traces the various nomenclatures which have been used from the time of Hansen to the Madrid Congress in 1953. Though classification is primarily clinical, a certain amount of laboratory help is needed. Fortunately for those in outlying areas in Africa most cases are either tuberculoid or lepromatous, presenting typical lesions clinically. Ernest Muir

WADE, H. W. **A Note on the Less Familiar Forms of Leprosy.** *Leprosy in India.* 1956, Apr., v. 28, No. 2, 41-9. [30 refs.]

It is emphasized that the primary criterion of classification is clinical, the Mitsuda test and histopathology being contributory but secondary. The intermediate form of the disease comprises those patients with simple flat macular lesions in the course of development. Some of these will become lepromatous, others tuberculoid. Those which take neither of these two courses but remain pale and anaesthetic should be classified as maculo-anaesthetic whether or not they are accompanied by clinical affection of the related nerves.

Major and minor tuberculoid forms are both chronic and the former should not be regarded as a reacting form of the latter. Two kinds of reaction are described in the tuberculoid type: *tuberculoid reactivation* where the nature of the lesions does not change in spite of the acute condition, and *reactional tuberculoid leprosy* with a relatively abrupt onset that causes marked clinical and histological changes. The borderline form occurs in a tuberculoid patient where there is loss of resistance for some reason or other, chiefly as the result of repeated reactions; but it is not in itself reactional. These cases are liable to be mistaken for lepromatous and the Mitsuda reaction may be negative; there are likely to be abundant bacilli, but the histological picture is different from that of the lepromatous type. The patients retain potentially some degree of resistance, but if left to themselves tend to become lepromatous. The question arises as to prognosis in cases which were formerly borderline and still retain that potential resistance.

Two kinds of lepromatous reaction are described: the ordinary acute reactivation where there are many bacilli, and the acute infiltration (pseudo-exacerbation) in which there are fewer bacilli. This latter occurs in patients under sulphone treatment, and it has been suggested that it occurs in those who had previously suffered from the borderline form but had become lepromatous, and that this reaction is a sign of this process in reverse and an attempt to change latent into active resistance.

Lastly is mentioned the "spectrum" concept, and it is considered that while polar cases are most common, there are between the two poles various gradations, and "intermingling and blending of the features of related varieties" [This paper is one of considerable value, and should help to clear up various points in classification which are difficult to understand.]

Ernest Muir

TAJIRI, I. **The "Acute Infiltration" Reaction of Lepromatous Leprosy.** *Internat. J. Leprosy.* New Orleans. 1955, Oct.-Dec., v. 23, No. 4, Pt. 1, 370-84, 10 figs. on 2 pls. [16 refs.]

The author describes 2 forms of reaction in tuberculoid leprosy, a milder and a more acute form (*akuter Schub*). He describes 3 forms of

reaction in lepromatous leprosy: (1) an acute reactivation caused by an increase of bacillus-containing cells; (2) erythema nodosum leprosum, most frequently in the resorptive phase under sulphone treatment; (3) an acute infiltration syndrome, which is the subject of this article. It occurs abruptly in lepromatous cases, sometimes overnight, with an erysipelas-like eruption. "The acute infiltration lesion itself consists mainly of infiltration of lymphocytes, plasma cells and epithelioid cells, sometimes with Langhans or atypical giant cells. Young lepra cells may be present in the new lesions, but older lipid-containing cells are usually absent. Seldom, if ever, are they found anywhere except outside the newly developed lesions as if they had been pushed aside by the infiltration. Needless to say, lipid-containing cells are seen in the sites of resorption of old lepromatous lesions." In 22 of the 24 cases described the Mitsuda test was positive, and this may be temporary or more permanent.

The differences between this form of leprosy and the reactional tuberculoid are that in the former the Mitsuda reaction is less strong, and that it occurs in patients with the lepromatous and not the tuberculoid type. It is suggested that, as in the borderline form the tuberculoid turns into the lepromatous, so this reaction may be a sign of the reverse process, the lepromatous (formerly borderline) regaining active resistance and returning to the tuberculoid.

Ernest Muir

LUCAS, C. J. **Leprosy diagnosed as Syringomyelia.** [Memoranda.]
Brit. Med. J. 1956, July 28, 214.

Two cases of neural leprosy are described which were at first mistaken for syringomyelia. Both occurred in Anglo-Indians who had previously lived in India. In one the diagnosis of leprosy was not made at first, in spite of loss in the right hand of pain, touch and thermal sensation (absence of dissociation which is characteristic of syringomyelia), as bacilli could not be found and thickened nerves could not be detected. A year later he was readmitted by which time he had developed claw hand and acid-fast bacilli were found in a lesion of the thigh.

The second patient, whose father had suffered from leprosy, was in the army and was discharged with a diagnosis of syringomyelia because of weakness and wasting of the hand, which had been present for 4 months. He had also a patch of anaesthesia over the right elbow which had remained unchanged for 10 years. Examination showed the right ulnar nerve thickened to the size of a pencil and several other areas of anaesthesia. The diagnosis was confirmed by biopsy.

The differential diagnosis between the two diseases is discussed. [One diagnostic feature is not mentioned: in such cases, when nerves are not thickened enough to be palpable, tingling can generally be elicited by percussion over the nerve supplying the affected cutaneous area.]

Ernest Muir

PRIETO LORENZO, A. Nuestra experiencia en el tratamiento de la neuritis leprosa. [Experience in the Treatment of Lepromatous Neuritis] *Med. Colonial.* Madrid. 1956, June 1, v. 27, No. 6, 542-60. [26 refs.]

The author begins by pointing out that the specific treatment of leprosy with sulphones and other drugs not only fails to relieve neuritis but even aggravates it at first; for a period of months the patient may have to suffer severe pain if it is not relieved by other remedies. He then enumerates a large number of therapeutic measures that have been used with more or less effect. Some of these act in a few patients but not in others, some give relief at first but the pain soon returns.

Short notes are given on the following remedies: ephedrine, adrenaline, formic acid, histidine, histamine, venom of various animals, alcohol infiltration into the nerve, local anaesthetics, gold salts, sodium bicarbonate orally or intravenously, and methylene blue. Next are mentioned vitamins D, K, E, B1 and B12. Of all the above the author places most reliance on a combination of vitamins B1 and B12. Even better results may be had with such hormones as corticotrophin and cortisone. Diathermy is useful and mention is also made of the results of other workers with ultrasonic radiation.

The fact that so many remedies are mentioned testifies to the want of reliability with any one of them, and it may be necessary to try one after another before getting relief.

Lastly, there is recourse to surgical interference in the more acute cases, or in those in which other remedies have failed. This is especially so in acute reactions where in a short time irreparable damage may be done to nerves by pressure, if not quickly relieved.

Ernest Muir

FLETCHER, A. G. & SHIRALKAR, W. B. Use of Aqueous Suspension of Avlosulfon Tablets in the Treatment of Leprosy. *Leprosy in India.* 1956, Apr., v. 28, No. 2, 50-52.

This is an account of the treatment of 35 patients with injections into the deltoid or buttock of a suspension of crushed Avlosulfon tablets, according to the method used by WILLIAMS [see this *Bulletin*, 1953, v. 50, 1148]. There was little pain and no lasting induration, especially when injections were given into the buttock. All improved except a tuberculoid patient who had treatment for only 6 months, and 3 became bacteriologically negative.

Ernest Muir

GHOSH, S. & MUKERJEE, N. Value of Isonicotinic Acid Hydrazide (I.N.H.) in the Treatment of Leprosy (a Review). *Indian J. Dermat.* Calcutta. 1956, Apr., v. 1, No. 3, 85-9. [48 refs.]

DE SOUZA-ARAUJO, H. C. **Experimental Leprosy in Monkeys. Pathogenic Action of Acid-Alcohol Fast Bacilli isolated from Lepers ("Chaves" and "Emilia" Strains) for *Macaca mulatta* and *Cebus fatuellus*.** *Mem. Inst. Oswaldo Cruz.* 1954, Sept.-Dec., v. 52, Nos. 3/4, 653-73. [Portuguese version 619-52, 42 figs. (10 coloured) on 10 pls.]

This is a record of the results of inoculation in the faces of 7 rhesus and 2 *Cebus* monkeys of cultures of acid-fast organisms obtained from 4 patients suffering from lepromatous leprosy. Inflammatory nodules were formed at the sites of inoculation, which on excision and sectioning showed massive infection with acid-fast bacilli with, in some cases, an appearance similar to that obtained in sections from lepromatous leprosy. In these lesions later sections showed a change to the appearance of tuberculoid leprosy. The article is well illustrated with photographs and photomicrographs of the lesions produced, and of the cultures used for inoculum. [For earlier work on the Chaves and Emilia strains see this *Bulletin*, 1951, v. 48, 647; 1952, v. 49, 155.]

Ernest Muir

NAKAMURA, M. **Attempts to approach to the Clarification of Chemical Composition of *Mycobacterium lepraeumurium*. II. Some Properties of the Bacilli from the Subcutaneous Tissue of Rat infected with *Mycobacterium lepraeumurium*.** *Kurume Med. J.* 1956, v. 3, No. 1, 29-33, 1 fig.

"Some chemical compositions of the bacterial cells of Myc. lepraeumurium separated from the infected tissue by means of chloroform fractionation were investigated. The results obtained demonstrate that Myc. lepraeumurium contains approximately the same amount of water and carbohydrate, contains somewhat less nitrogen, and contains more abundant alcohol-ether extractable and phosphorous fraction than other acid-fast bacilli which can cultivate in vitro."

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—TREMATODES (schistosomes, other flukes); CESTODES (Diphyllobothrium, Taenia, Echinococcus, other cestodes); NEMATODES (Hookworms, Ascaris, Filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.).

AMERICAN J. TROP. MED. & HYG. 1955, May, v. 4, No. 3, 381-460. 2 figs. & 1 chart. [Numerous refs.] **Symposium on Schistosomiasis.**

The avowed objects of the speakers at the symposium were to "report work done on the respective topics listed, point out gaps in our knowledge.

and attempt to indicate directions for future work". After each paper a brief discussion of its contents was contributed by a selected speaker.

The symposium was opened by D. B. McMULLEN who pointed out that molluscan-borne schistosomiasis, like the arthropod-borne infections, was an extremely complicated "bio-economic problem" and that our understanding of schistosomiasis lagged far behind our knowledge of the arthropod-transmitted diseases, since our therapeutic drugs were inadequate and our molluscicides impractical, except under limited conditions. Past experience of other diseases warranted the hope that some adventurous or plodding endeavour would show the way over or across the worst obstacles, but that meanwhile we must face the fact that we had a long way to go before a satisfactory way of controlling schistosomiasis had been discovered.

R. E. KUNTZ discussed the classification of the schistosomes which had resulted from studies of the eggs, the adults and the cercariae. As regards the criteria available from a study of the cercariae, it was at first believed that a knowledge of their morphology offered a means for the recognition and differentiation of different species of schistosomes, but this hope had not been fulfilled. "The study of cercariae demands careful handling, patience and very exacting observations; consequently there has been considerable disagreement on the morphology. Unfortunately, the disagreement has rendered this phase of study more of a detriment than an asset in an understanding of schistosome biology." Studies based on the adult forms and the eggs suggested that in Africa the once supposedly stable species, *S. haematobium* and *S. mansoni*, consist of many closely related species, sub-species or varieties, whose relationship to their human and animal hosts is not yet understood. If the existing knowledge of the relationship between the African schistosomes and their vertebrate hosts is lacking in detail, our knowledge of their relationship to their various molluscan vectors is far more confused, and neither attempts at simplification of classification nor yet the elaboration resulting from the description of an ever increasing number of species and sub-species of snail host have proved satisfactory. In Portugal, also, the situation is not as clear as was at first believed, since all attempts to infect snails other than *Planorbis dufouri* with the miracidia of the local *S. haematobium* have failed. In India a small endemic centre of *S. haematobium* was discovered in the Bombay State in 1952 [this *Bulletin*, 1953, v. 50, 317]. Apart from this finding, all cases of human schistosomiasis reported as autochthonous from India probably represent rare or accidental infections of man by one of the schistosomes normally parasitic in other mammals. In America although only one species of schistosome (*S. mansoni*) is recognized as parasitizing man, there is disagreement on the morphological features of its cercarial stage, particularly as regards the number of penetration glands. The author suggested that this discrepancy may be due to the fact that in some instances the cercariae examined were those normally discharged from the snail and therefore mature, and in other instances obtained by

dissection and therefore possibly immature [see GORDON and GRIFFITHS, this *Bulletin*, 1952, v. 49, 1055]. "In the Orient, *S. japonicum* is transmitted by several species of *Oncomelania* and infects man and a wide range of mammalian hosts over a large geographical area. Recent studies indicate the existence of geographical and physiologic strains of the parasite and its intermediate host. On Formosa, contrary to the situation in other areas of the Orient, *S. japonicum* is a parasite of lower mammals, man playing only a questionable role in its propagation. The Formosan schistosome has been designated as a 'non-human' strain."

L. OLIVIER spoke on "The Natural History and Control of the Snails that transmit the Schistosomes of Man". His remarks applied only to the so-called aquatic vectors of *S. mansoni* and *S. haematobium* and not to the amphibious vectors of *S. japonicum*. The former schistosomes have not only been able to maintain themselves but there is evidence that even now, while great strides are being made towards the control of many parasitic diseases, schistosomiasis is actually increasing in prevalence and spreading to new areas. The author pointed out that we lack adequate knowledge of the natural history of the molluscan vectors of oriental schistosomes and that although this gap should not prevent immediate attempts at snail control, nevertheless, if we were to make the best use of the available means of killing snails, we must acquire more knowledge of their biology. "In Northeastern Brazil some of the snail habitats are without water throughout the annual dry season which lasts from five to seven months. The vector snails survive the dry season in these areas and reinfest the water during the wet season. . . . Experiments conducted in the laboratory with the same snails showed that they do not conserve their moisture effectively at low relative humidities, and that they must be kept at high relative humidities if they are to survive long out of water. It follows, then, that the humidity of the micro-environment surrounding the snails in the field during the dry season is of the greatest importance in determining whether they survive until the return of water." The author concluded his address with some remarks on various methods which may be employed for the control of the snail vectors and came to the conclusion that "With the information and materials available at present, it may be feasible in a few selected areas, to attempt eradication of schistosomiasis transmitted by so-called 'aquatic' vectors. However, in most of the endemic areas, eradication is probably not attainable in the near future, and in many of the worst areas no more than a partial interference with transmission can be hoped for".

L. S. RITCHIE presented a paper on the biology and control of the amphibious snails *Oncomelania nosophora*, *O. quadrasi* and *O. formosana*, which serve as intermediate hosts for *Schistosoma japonicum*. Recent reports have emphasized the need for fundamental studies on the biology of these vectors, if molluscicides are to be used with the maximum efficiency. As regards the food requirements of these snails, "It appears that decaying matter, high in cellulose content and poor in protein, and

living unicellular organisms of the soil constitute primary foods. Whether the juvenile snails depend on a different diet than adults must also be investigated". The danger of placing too much reliance on aquarium observations is illustrated by the findings that "snails survive longer on filter paper alone than on either of nine other substances, including fish foods, leaves, soil, liver extract, weathered wood and celotex". As regards their aquatic habits he stated that among *Oncomelania* snails, "activity appears to be characterized by a delicate amphibious balance, being neither decidedly aquatic nor terrestrial". With brief wettings at intervals varying from 1 to 4 weeks, adult snails would survive as long as 47-126 days and immature snails from 15 to 147 days; these findings are particularly impressive since feeding was excluded throughout the test. On the other hand, uninterrupted wetness must prevail during the period of propagation, although a proportion of the eggs may survive 48 hours' drying at room temperature. There seems to be a tendency for the snails to prefer waters with slight to medium acidity but further studies are needed. In the case of *O. formosana*, copulation is most common in the spring but no seasonal occurrence has been noticed in *O. quadrasi*. In the absence of soil, the snails will cover the eggs with a firmly cemented layer of faeces but the discriminate use of faeces in the presence of soil has not been demonstrated. In the case of *O. nosophora* 95 per cent. of the eggs are deposited just above the water line, whereas in the case of *O. quadrasi* one-third of the eggs are deposited below it. The immature *O. nosophora* snails grow at the rate of about 0·4-0·5 mm. per week, *O. formosana* about 0·3 mm. per week and *O. quadrasi* about 0·25 mm. per week. In nature these rates of growth are dependent on seasonal changes in regard to temperature, etc., and in the case of *O. nosophora* no growth appears to take place between October and April. The life-span of the different species has not been conclusively established but it is known that *O. nosophora* can survive for at least 4 years. [Dr. Ritchie then went on to discuss naturalistic methods of control and certain molluscicides which have been used with varying degrees of success. A brief abstract of this part of his paper would not do justice to his excellent summarization of the present situation, and those who are interested should read the original.]

J. OLIVER-GONZÁLEZ, P. M. BAUMAN and A. S. BENENSON spoke on immunological aspects of infections with *Schistosoma mansoni*. The authors' summary is as follows:—

"1. Antibody studies in the sera from human subjects infected with *Schistosoma mansoni* have revealed the presence of cercarial precipitins, cercarial agglutinins, and circumoval precipitins. Adult precipitins were also detected, but in low titers and in a small per cent of the sera tested.

"2. There were differences observed in the concentration of these antibodies as related to the duration of infection. In early infections (40 to 240 days after exposure to cercariae) cercarial precipitins and

agglutinins have high titers but become low or negative in infections of long duration (10 years and over). Circumoval precipitins are present in both recent and old infections but become more active in older infections.

" 3. The adult, cercarial, and egg antibodies as produced by artificial immunization of the rabbit are stage specific. Treatment of rabbit anti-serum with lyophilized adult or cercarial material results in the absorption of the homologous but not of the heterologous antibodies. Treatment of anti-adult, anti-cercarial, and anti-egg sera with egg material absorbs only the homologous and the cercarial antibodies. This postulates a cercarial factor in the egg.

" 4. No circumoval precipitins were detected in the sera from mice with single sex infections. This provides further evidence confirming stage specificity of the circumoval antibody which only develops in the presence of eggs.

" 5. Successful Fuadin therapy as determined by repeated negative stools and rectal biopsy reduces the circumoval activity of sera. This effect was observed within a year after therapy. The reduction in circumoval precipitin content of serum may be used as a test to determine the therapeutic effect of Fuadin or other anti-schistosome drugs. The circumoval precipitin test, therefore, is both of diagnostic and prognostic value.

" 6. Intradermal response to egg antigen differs from that elicited against adult and cercarial antigens in that a negative reaction is observed in active cases. The skin response becomes positive after treatment of infection.

" 7. Knowledge of stage-specific antibodies, and the time during the course of infection when their concentrations are highest, is of great importance in the serological diagnosis of schistosomiasis. Stage-specific antibodies are also of great interest in the study of the mechanism of acquired immunity to schistosomiasis."

F. B. BANG in his discussion of Oliver-González's paper described previous work on serological tests which utilized the exposure of some stage of the living worm to serum. He pointed out that, with the apparent exception of the reaction to the egg which Olivier had described in his address, there was a lack of specificity in these reactions.

H. MOST contributed a brief paper on the treatment of schistosomiasis. "At the present time tartar emetic in my opinion is the most effective drug in the treatment of the three human schistosomal infections. Total doses of 2.5 gm., 1.8 gm., and 1.5 to 1.75 gm., will cure more than 90 per cent of infections due to *S. japonicum*, *S. mansoni* and *S. haematobium*, respectively. The principal disadvantages attending the use of tartar emetic are that the drug requires care and experience in administration, is moderately toxic, and must be administered intravenously during a relatively long course requiring numerous injections." In regard to intensive treatment with sodium antimony tartrate, the author was of the opinion that, although the cure rates in *S. mansoni* and *S.*

haematobium infections were significantly enhanced by this treatment, similar courses of treatment were ineffective in *S. japonicum* infections. H. H. ANDERSON in his discussion of Dr. Most's paper was of the opinion that not all physicians were aware of the need for beginning with very small doses of antimony and, after some tolerance to the drug had developed, building up the dosage to much higher levels than were possible at the commencement of treatment.

R. M. Gordon

- I. DHANDA, Leila. **Infestation with Ova morphologically resembling *Schistosoma haematobium*.** *J. Indian Med. Ass.* 1956, June 1, v. 26, No. 11, 407-8.
- II. J. INDIAN MED. ASS. 1956, June 1, v. 26, No. 11, 430-31. [26 refs.]
Schistosomiasis in India. [Editorial.]

I. During routine examination in New Delhi of some 500 stool specimens from middle-class people, between March and October 1955, fertile terminal-spined ova resembling those of *Schistosoma haematobium* were recognized in 4 of the specimens. None of the persons (2 adult males and 2 adult females) supplying the specimens suffered from symptoms or signs of urinary schistosomiasis, and no ova could be found in their urines on what examinations were possible. The patients had not resided outside India, and details of their residence in India were ascertained; only 2 had lived for a time slightly south, or east, of Delhi. The author, recalling the previous disclosure of the existence of human schistosomiasis in a village in Bombay State [this *Bulletin*, 1953, v. 50, 317], considers that awareness of the existence of this infection in the subcontinent may result in further records of it from the profession in general in India.

II. After a brief general account of the recognized human forms of schistosomiasis, there is a useful list of the reports of cases of schistosomiasis infection in India since 1903. This well documented and interesting summary will be of much value to those currently working on the subject. Since the disclosure of a focus of infection in Bombay State the belief has grown that a true human schistosomiasis, as opposed to sporadic infection with parasites normally animal, may in fact be endemic in India. The natural molluscan vector has not been incriminated though the snail *Ferrissia tenuis* has experimentally been infected with *S. haemotobium* [*ibid.*, 1956, v. 53, 606], and a species of *Melanoides* was found to be infected naturally with a furcocercous cercaria morphologically indistinguishable from that of *S. haematobium*. The distinction of the species of terminal-spined schistosome ova from man and various animals presents insuperable difficulties; before the true origin of the human cases of schistosomiasis in India can be determined further extensive investigations obviously are necessary; adult worms and both their mammalian and their intermediate hosts must be identified and their distribution defined.

A. R. D. Adams

SHERIF, A. F. **A New Intradermal Antigen for the Diagnosis of Schistosomiasis.** *Ann. Trop. Med. & Parasit.* 1956, June, v. 50, No. 2, 105-12, 2 figs. on pl. & 1 diagram. [20 refs.]

The new antigen is prepared from the miracidia of *Schistosoma haematobium*. The details of the preparation should be obtained by consulting the original paper; but briefly—urine is filtered through a sieve with 150 μ mesh and then through another of 40 μ mesh which holds back the ova; these are caused to hatch by incubating in water; alcohol is added, the killed miracidia are concentrated by centrifuging, and the deposit is dried and ground to powder. Subsequently a suspension of 1 per cent. powder in saline is made and stored in the cold for 2 days; the fluid is passed through a Seitz filter and an equal volume of saline containing 0.8 per cent. phenol is added. The final solution thus contains the equivalent of 0.5 per cent. antigen.

For use, the solution was further diluted 1:10, and 0.25 cc. was injected intradermally into one forearm; a control of 0.4 per cent. phenol saline was injected into the other arm. The appearance within 20 minutes of a weal at least 10 mm. in diameter surrounded by erythema was considered a positive reaction. The results were as follows:—

470 patients with active schistosomiasis,	all	gave positive reactions;
250 persons without	"	" negative "
224 patients	"	
	but with intestinal parasites,	" "
119	,, cured of schistosomiasis	" "
	6 months or more before,	" "
33	,, cured 3-6 months before, 30	" "
	3	positive "
53	,, 1-3	" all "
50	,, undergoing treatment	" with antimonials, "

The appearance of the weal is shown in 2 photographs.

[If these remarkably consistent results can be confirmed elsewhere, a valuable advance will have been made in the diagnosis of schistosomiasis.]

F. Hawking

RAOULT, A., MICHEL, L. & DIOUF, J. Nouveaux essais de traitement de la bilharziose par l'A.B.5. [New Trials in the Treatment of Schistosomiasis with AB 5] *Bull. Méd. de l'Afrique Occidentale Française*. 1955, v. 12, 137-220.

AB 5 [see this *Bulletin*, 1955, v. 52, 378] a complex synthetic antimonial, is given by both intravenous and oral routes concurrently in the treatment of schistosomiasis. The authors now record in considerable detail the histories of 44 patients at Dakar suffering from heavy infections with *Schistosoma haematobium* or *S. mansoni*, or with both parasites, and treated with this drug. The course of treatment, details of which

should be sought in the original, extended over 5 days. In a few cases a second course of treatment was given, in some few others the treatment was incomplete or interrupted for various reasons. The side-effects were a sensation of warmth extending from the chest all over the body at the time of the intravenous injection; nausea and vomiting immediately after it, sometimes associated with headache and giddiness; and, in a very few cases, diarrhoea and asthenia.

Urine and stools were examined microscopically each day before, during, and immediately after treatment, and thereafter at weekly intervals, for periods in some cases as much as 12 weeks. In cases of urinary schistosomiasis pain and haematuria were rapidly relieved, and there was improvement in the appearance of the bladder on cystoscopy; in the cases of rectal schistosomiasis the eggs soon vanished from the stools. In some of the cases of hepatosplenomegaly the spleen markedly decreased in size. The contra-indications to the employment of AB 5 are those common to other antimonial drugs, and death resulted in one case from the drug; this would have been expected in this case if tartar emetic or anthiomaline had been used. Nevertheless, the side-effects in otherwise robust persons are rarely sufficient to require cessation of the treatment. The authors think that AB 5 is a valuable addition to the drugs used in the treatment of schistosomiasis, particularly in view of the brevity of the course needed, and they feel that its merits should be explored on a greater scale.

A. R. D. Adams

PARAENSE, W. L. & DESLANDES, N. **Observations on "Australorbis janeirensis" (Clessin, 1884).** Reprinted from *Rev. Brasileira Biologia*. Rio de Janeiro. 1956, Apr., v. 16, No. 1, 81-102, 48 figs. [14 refs.]

Hsü, H. F. & Hsü, S. Y. Li. **On the Infectivity of the Formosan Strain of Schistosoma japonicum in Macaques.** *Amer. J. Trop. Med. & Hyg.* 1956, Jan., v. 5, No. 1, 136-44, 3 figs.

"Thirty-six macaques (29 from Formosa, 3 from Japan and 4 from the Philippines) were exposed to *S. japonicum* cercariae of three geographical strains (Formosan, Japanese and Philippine). The degree of susceptibility of the monkey species to the strains of the parasite was ascertained by the length of the prepatent period, the number of eggs produced, the immature-mature egg ratio, and the number of adult worms at autopsy.

"The results of the experiments showed that the Formosan monkey was highly susceptible to the Japanese and Philippine strains but was a relatively poor host for the Formosan strain. On the other hand, the Philippine and Japanese monkeys made reasonably good hosts for the Formosan strain of the parasite. This indicates that the Formosan strain of *S. japonicum* differs from the Japanese and Philippine strains."

CHUNG, Huei-Lan, HOU, Tsung-Ch'ang, LI, T'ien-Huang, SHEH, Ming-P'eng & YANG, Ch'ung-Li. **Recent Advances in Diagnosis of Paragonimiasis.** *Chinese Med. J.* Peking. 1956, Jan.-Feb., v. 74, No. 1, 1-16, 15 figs. [12 refs.]

** 1. Three procedures constituting an advance in the diagnosis of paragonimiasis particularly in cases with obscure, atypical, early, latent or inapparent infection without discharge of ova in excreta are presented.

“ 2. Six very obscure cases are reported to illustrate the value of the new diagnostic triad.

“ 3. Summary of the main autopsy findings of 2 very instructive cases (Case 1 and Case 2) are given in some detail. The postmortem findings have fully proved the value of these diagnostic procedures and the unwisdom of relying too much on the findings of certain highly specialized laboratory methods of diagnosis. In these 2 cases the roentgenological findings of the chest, the electrocardiographical changes, and the reported discovery of ‘tubercle bacilli’ in the cerebrospinal fluid, obviously due to laboratory error, were disproved by the autopsy findings. Both the patients had no tuberculosis either of the lungs or the meninges but had paragonimiasis with fatal cerebral involvement and adhesions between the chest wall, the lungs, the pericardial sac and the diaphragm.

“ 4. Two new endemic areas of paragonimiasis were discovered through the diagnosis of 2 exogenous cases (from Kirin and Szechuan provinces) seen in Peking. These cases would have been missed had it not been for the fact that the new diagnostic triad was carefully applied.

“ 5. The proposed diagnostic triad constitutes a very useful weapon in surveys of and campaigns against paragonimiasis, as it facilitates early and accurate diagnosis. According to our recent experience in Kwang-tung province the same principles, particularly the skin test, may be applied with advantage in surveys of and campaigns against parasitic diseases like schistosomiasis, clonorchiasis, etc.

“ 6. The intradermal test is a very convenient and fairly reliable procedure for screening paragonimiasis cases in epidemiological surveys. Only skin-test positive cases need be subjected to sputum examination for paragonimus ova and serum complement fixation test.”

ROWAN, W. B. **The Mode of Hatching of the Egg of *Fasciola hepatica*.** *Exper. Parasit.* New York. 1956, Mar., v. 5, No. 2, 118-37, 10 figs. on 2 pls.

“ 1. The egg of *Fasciola hepatica* Linn. was used to test three theories of the mode of hatching of trematode eggs.

“ 2. Exposure to light stimulates the miracidium to release an enzyme

[* The three procedures are as follows: (1) epidemiological considerations, e.g. history of having eaten raw crab or raw crayfish from a known endemic region; (2) intradermal test; (3) complement-fixation test of serum and spinal fluid.]

that digests a substance binding the operculum to the shell; it is a change in this bonding substance that permits the egg to open.

" 3. The natural 'hatching enzyme' acts from within the shell, and it has no effect on the bond when applied to the outer surface of the shell.

" 4. Solutions of crystalline pepsin and trypsin digest the bonding substance when they are permitted to come in contact with the inner surface of the shell; diastase and hyaluronidase are without effect. That both pepsin and trypsin destroy the bond suggests the substance is a protein and the 'hatching enzyme' is proteolytic in function.

" 5. At the opercular end of the egg cavity and within the vitelline membrane lies a viscous cushion of material in the shape of a concave-convex lens. A sequence of changes in the cushion serves as a prologue to the hatching process. During this prologue the refractive index of the cushion changes slightly at one or more points, and a few seconds thereafter the material of the cushion expands rather suddenly to twice its original volume. After a brief interval, and then, in rapid succession, the operculum opens with force as if hinged to the shell, the vitelline membrane ruptures, the cushion material flows out of the shell and usually dissipates, and the miracidium promptly follows the cushion material through the narrow opening.

" 6. Experiments demonstrate that the escape of the miracidium from the opened egg is due primarily to the hypertonicity of the egg contents and only secondarily to the muscular activity of the larva."

GINNSBERG, A., CAMERON, J., GODDARD, W. B. & GRIEVE, J. M. **Bovine Cysticercosis, with particular reference to East Africa.** *Bull. Epidemiol. Dis. of Africa.* 1956, June, v. 4, Nos. 1/2, 27-39. [21 refs.]

See also this *Bulletin*, 1954, v. 51, 813.

CONGIU, M. & PIRLO, F. Variazioni elettroforetiche delle sieroproteine nell'idatidosi. [**Electrophoretic Pattern of the Serum Proteins in Hydatid Disease**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1956, Aug., v. 37, No. 8, 428-33. [20 refs.]

The English summary appended to the paper is as follows:—

" The authors have studied the electrophoretic pattern of serum-proteins in patients suffering from pulmonary and hepatic echinococcosis without suppuration. They found a remarkable hypoproteinemia with gamma-globulinemia in the hepatic hydatid; in the pulmonary localization the sero-proteic pattern was less remarkable, although constant."

THIODET, J. Allergie et anaphylaxie hydatiques. Réactions biologiques employées pour le diagnostic de l'hydatidose. [**Allergy and Anaphylaxis in Hydatid Disease. Biological Diagnostic Reactions in Hydatidosis**] *Algérie Méd.* 1955, Mar., v. 59, No. 3, 151-70.

THIODET, J., FOURRIER, A. & POGGIOLE, A. Les réactions hépatiques de l'hydatidose. [Hepatic Reactions in Hydatid Disease] *Algérie Méd.* 1955, Mar., v. 59, No. 3, 205-16. [31 refs.]

HERRERO AYLLÓN, R. Contribución al estudio de la lucha contra la hidatidosis. [Study of the Control of Hydatid Disease] *Rev. Sanidad e Hig. Pública*. Madrid. 1955, Sept.-Oct., v. 29, Nos. 9/10, 517-77, 9 figs. (7 on 3 pls.).

YASUDA, M. [Studies on the Parasite Elements in the Gallstones: especially the Method for detecting them] *Hirosaki Med. J.* 1955, Dec. 30, v. 6, No. 4, 391-403, 8 figs. on 2 pls. [20 refs.] [In Japanese.] English summary *90-*91.

The author, from Hirosaki University, Japan, has devised a method whereby parasitic elements may be detected in gallstones by chemical elimination of non-parasitic elements.

From the centre of the gallstone about 0.05 gm. of material was taken and ground in a 50 cc. centrifuge tube. One cc. of chloroform was added and the whole stirred. To this material was added a mixture of 30 cc. methanol and 3 cc. concentrated HCl; stirring was repeated for 10 minutes, the whole was centrifuged at 3,000 r.p.m. for 10 minutes and the supernatant fluid discarded. This step was then repeated, except that 6 cc. commercial antiformin was used in place of HCl. The sediment was washed with distilled water and centrifuged for 10 minutes, and the final sediment examined microscopically.

By this method 64 bilirubin-chalk stones and 14 cholesterol stones were examined: all had been removed surgically during the previous 10 years. No parasitic elements were found in the cholesterol stones. In the bilirubin-chalk stones, parasitic elements were found in 35. These included the cuticle of *Ascaris* with (4 times) or without (8 times) eggs or other elements; eggs only (20 times); eggs and other elements (once); eggs of *Clonorchis sinensis* (once) and in the remaining case the eggs of an unidentified parasite.

Similar examinations were made on 50 more bilirubin-chalk stones sent from various hospitals in the Aomori Prefecture. In these cases parasitic elements were found in 28, in similar proportions to those in the first series. The total findings in each series were very similar, viz. just over half of the bilirubin-chalk stones showed parasitic elements.

These stones are very commonly found among the Japanese and it would seem that *Ascaris* plays a great part in their formation. [See also this *Bulletin*, 1956, v. 53, 465.]

H. J. O'D. Burke-Gaffney

DA COSTA, O. R., MANCEAU, J. N., MAROJA, R. & DE ANDRADE, G. C.
Observações sobre a ação do hexylresorcinol nas infestações por
áscaris. [Action of Hexylresorcinol on Ascaris Infections] Rev.
Serviço Especial de Saúde Pública. Rio de Janeiro. 1955, Dec.,
v. 8, No. 1, 201-4, 1 graph.

The English summary appended to the paper is as follows:—

“ Experiments have been made to measure the efficacy of hexylresorcinol when administered in the form of pills as compared with its efficacy when administered in the form of jelly capsules. Results showed that there was a significant difference in the two methods, with the capsules proving to be more efficient than the pills.”

DA COSTA, O. R. Observações sobre a ação do Hexylresorcinol-Metoquina e dessas drogas isoladas, nas infestações por ancilostomídeos, áscaris, tricocéfalos e oxiuros. [The Action of Hexylresorcinol and Mepacrine separately and together, on Hookworm, Ascaris, Trichuris and Enterobius Infections] Rev. Serviço Especial de Saúde Pública. Rio de Janeiro. 1955, Dec., v. 8, No. 1, 257-69. [18 refs.]

The English summary appended to the paper is as follows:—

“ Experiments were made to investigate the comparative action of hexylresorcinol and metoquin [mepacrine] administered separately and together.

“ The analysis of the data presented in the tables warrants the following conclusions:

“ 1) Judging by the decrease in the number of eggs per gram of feces, verified after administration of the drugs, hexylresorcinol appears to be more efficient than metoquin in the treatment of infestation by hookworm, ascaris.

“ 2) The available data is not sufficient to warrant conclusions as to whether hexylresorcinol is superior to metoquin in the treatment of infestation by trichocephalus.

“ 3) Hexylresorcinol and metoquin when administered together appear to be more effective in the treatment of infestation with hookworm and trichocephalus than either of the drugs when used alone.

“ 4) The available data is not sufficient to warrant conclusions as to the efficacy of metoquin, hexylresorcinol or the associated drugs in the treatment of infestation by oxyuris.”

See also p. 1368, BROWN *et al.*, Treatment of Enterobiasis and Ascariasis with Piperazine.

See also p. 1368, RICCI & CORBO, Sull'azione dell'adipato di piperazina verso *E. vermicularis* e *A. lumbricoides*. [Action of Piperazine Adipate on Enterobius and Ascaris]

MANCEAU, J. N. Aplicação da análise de covariância ao estudo comparativo de dois anti-helmínticos. [Application of Analysis of Covariance in the Comparative Action of Two Anthelmintic Drugs] *Rev. Serviço Especial de Saúde Pública*. Rio de Janeiro. 1955, Dec., v. 8, No. 1, 205-19, 2 graphs.

The English summary appended to the paper is as follows:—

"For the purpose of comparing the effect of Hexylresorcinol to that of Aralen in the treatment of infestations by *Ancylostoma*, *A. lumbricooides* and *T. trichiura*, an experiment was carried out and an analysis of the covariance of results showed that Hexylresorcinol is more effective than Aralen in the treatment of infestations by *A. lumbricooides* and *Ancylostoma*."

DENT, J. H., NICHOLS, R. L., BEAVER, P. C., CARRERA, G. M. & STAGGERS, R. J. **Visceral Larva Migrans: with a Case Report.** *Amer. J. Path.* 1956, July-Aug., v. 32, No. 4, 777-803, 36 figs. [19 refs.]

See also this *Bulletin*, 1954, v. 51, 420.

SOUTH PACIFIC COMMISSION. Noumea, New Caledonia. **Annotated Bibliography of Filariasis and Elephantiasis. Part 2. Studies on Mosquitoes of the South Pacific Region** [IYENGAR, M. O. T.]. Technical Paper No. 88. 1956, Jan., xi + 114 mimeographed pp., 1 map, [6s.]

See this *Bulletin*, 1955, v. 52, 467.

GOLVAN, Y. J. La rétractilité des microfilaries sanguicoles dans les gouttes épaisses, ses modalités et sa valeur diagnostique. [Contraction of Microfilariae in Thick Blood Films and Its Value in Diagnosis] *Ann. Parasit. Humaine et Comparée*. 1956, Jan.-Mar., v. 31, Nos. 1/2, 139-46, 1 fig. & 1 pl.

One of the outstanding characters of microfilariae in thick-drop blood films is their "attitude". Microfilariae of *Wuchereria bancrofti*, *Mansonella ozzardi* and, to a lesser extent, those of *Dipetalonema perstans* possess regular and graceful curves. The microfilariae of *Loa loa*, of *W. malayi* and *W. bancrofti* var. *vaucleri*, on the other hand, present curves with secondary undulations which give them a characteristically twisted and shrunken appearance. Some experts can distinguish in fresh preparations, without any vital staining, between the microfilariae of *bancrofti* and *loa* by their actual movements, and it is quite possible that this is the property, when alive, which determines their attitudes when dead and fixed, but in the author's opinion this is not the essential cause. FÜLLEBORN [this *Bulletin*, 1914, v. 3, 97], FENG [*ibid.*, 1934, v. 31, 805],

IYENGAR [*ibid.*, 1940, v. 37, 652] and WILSON [*ibid.*, 1956, v. 53, 1156]. have recognized the importance of these points in recently spread blood preparations, but recognize that in those older than 10 days the embryo of *W. bancrofti* contracts considerably, so that the principal curvatures become complicated by secondary undulations resembling those of *L. loa* and of *W. malayi*.

In order to verify these statements the author examined a number of very old films in the Institute of Parasitology of the Faculty of Medicine in Paris, and stained them by a variety of methods, with the emphasis on Giemsa. In recently prepared thick drops the embryos of *W. bancrofti*, *L. loa*, *D. perstans*, *D. blancii* and *D. gracile* were stained by usual methods; no shrinking of the microfilariae was observed and their colouration was normal. However, morphological changes, including retraction, were seen when the staining was modified. In older films of *L. loa*, *D. perstans* and *D. blancii*, in thick drops of 10–15 days' standing, as well as some of *W. bancrofti* from Calcutta made 25–35 days previously, the shrinkage, particularly of *W. bancrofti*, proved to be minimal.

"In old thick drops the shrinkage of microfilariae of *W. bancrofti* is obvious. Nevertheless, in no case, this state of things hinders identification of this species which is always easy." When microfilariae of *W. bancrofti* decrease in length through shrinkage their width increases and this feature serves to identify them. In addition various microfilariae do not shrink in exactly the same way. In the *loa*, *malayi* and *vaucllei* group the nuclear column follows the windings of the cuticle, while in *bancrofti* the nuclear column is twisted inside the wrinkled cuticle. Retraction in itself does not influence other differential features, such as the cephalic space, size of the excretory and anal pores, the *innenkörper* (or *corps interne*) or arrangement of nuclei in the tail. In thick blood films, 35 days old, it proved easy to identify the excretory and genital cells. Thus, even under the most unfavourable conditions, it is possible to diagnose different species of microfilariae.

Philip Manson-Bahr

DODIN, A. & ROGÉ. Variation de la vitesse de sédimentation et de la formule sanguine chez des porteurs de microfilaires de *Wuchereria* avant et après traitement par un sel de piperazine. [Variation of the Sedimentation Rate and the Eosinophilia in Persons Infected with *Wuchereria bancrofti*, before and after Treatment with Diethylcarbamazine] *Arch. Inst. Pasteur de Madagascar*. 1955, 13–16.

The object of this work was to study variations in the sedimentation rate during the day and night in relation to the migration of the microfilariae of *Wuchereria bancrofti* and to the administration of Notézine (diethylcarbamazine). In spite of two courses with this drug it was not possible to render more than 9 out of 13 patients free from microfilariae.

No appreciable alteration in the sedimentation rate was recorded despite the nocturnal periodicity of the microfilariae. On the other hand

the rate was improved when these embryos disappeared as a result of treatment.

There was, moreover, no variation of the eosinophilia, either by day or night, to correspond with the periodicity of the microfilariae: but the eosinophilia increased after treatment, tending, however, in some cases to revert eventually to the pre-treatment level. *Philip Manson-Bahr*

ROUSSELOT, R. Hépatite filaire des Anthropoïdes. [Filarial Hepatitis in Anthropoids] *Bull. Soc. Path. Exot.* 1956, Mar.-Apr., v. 49, No. 2, 301-3, 2 figs. on pl.

JACOTOT, H., DESCHIENS, R., VALLÉE, A. & DEZEST, G. Splénite chronique dans un cas de filariose chez un cynocéphale. [Chronic Splenitis in a Flying Lemur (*Cynocephalus*) with Filariasis] *Bull. Soc. Path. Exot.* 1956, Mar.-Apr., v. 49, No. 2, 300-301, 2 figs. on pl.

LIPPARONI, E. Ricerche sulla incidenza della ossiurosi con lo "Scotch Cellophane Tape" (metodo di Graham) fra la popolazione infantile somala dell'età scolare al Villaggio Duca degli Abruzzi. [Investigation by Graham's Scotch Cellophane Tape Method of the Incidence of Enterobiasis among Somali Children of School Age in the Duke of Abruzzi Village] *Riv. di Parassit.* Rome. 1956, Apr., v. 17, No. 2, 91-5. [10 refs.] English summary (5 lines).

The author gives an account of an investigation into the incidence of enterobiasis among 197 children of school age in the village named after the Duke of Abruzzi in Somaliland.

A total of 130 children attended the village school [but no details are given of the remainder]. The ages ranged from 6 to 12 years and 162 were boys and 35 girls. After one examination 84 boys and 20 girls were found to be positive but it was not possible to carry out a further examination of the negative cases. There was no difference in the infection rate in the various ages. *W. K. Dunscombe*

DA COSTA, O. Incidência de "Enterobius vermicularis" em 359 escolares de Belém, Pará. [Incidence of *Enterobius* Infection in 359 School-children in Belém, Brazil] *Rev. Serviço Especial de Saúde Pública.* Rio de Janeiro. 1955, Dec., v. 8, No. 1, 221-9, 2 figs. [16 refs.]

The English summary appended to the paper is as follows:—

"The incidence of *Enterobius vermicularis* was verified for the first time in the Amazon Region, using cellulose adhesive tape for the collection of parasite eggs. A group of 359 school children in Belém, Pará, was examined by this method and 132 or 36.7 percent were found to have this infestation."

BEDDOE, H. L. **Peritoneal Granuloma due to *Enterobius vermicularis*.**
J. Dis. Children. Chicago. 1956, June, v. 91, No. 6, Sect. 1,
 577-80, 2 figs.

"A granuloma of the pelvic peritoneum due to *E. vermicularis* is reported. This is the 20th such lesion reported in the literature and only the 3rd one to directly cause symptoms leading to surgical intervention. The 16-month-old girl is the youngest in whom such lesion has been reported."

[See this *Bulletin*, 1951, v. 48, 748; 1954, v. 51, 1280.]

RICCI, M. & CORBO, S. Sull'azione dell'adipato di piperazina verso *E. vermicularis* e *A. lumbricoides*. [Action of Piperazine Adipate on *Enterobius* and *Ascaris*] *Riv. di Parassit.* Rome. 1956, Apr., v. 17, No. 2, 97-104. [12 refs.]

The English summary appended to the paper is as follows:—

"The authors have treated with piperazine adipate 335 children from 6 to 12 years of age affected by enterobiasis. The drug was administered in solution, as suspension and in tablets: 1·8g of active substance *pro die* for a period from 2 to 5 days.

"Among the treated cases only 252 have regularly followed the treatment and have undergone routine controls. No substantial differences were observed in the activities of the various formulations. The following percentages of cured cases were obtained: 70·37% on 27 children treated for 2 days; 87·18% on 39 children treated for 3 days; 95·10% on 102 children treated for 4 days; 94·05% on 84 children treated for 5 days. The majority of non-cured subjects showed a great reduction in the number of pinworm eggs.

"36 individuals affected by ascariasis have been treated for a single day with about 4g of piperazine adipate in solution. The following day, 20g of sodium sulphate was administered. All patients have passed from 2 to 37 worms; in 94·44% of patients no eggs could be found in the stools after treatment.

"24 individuals who were parasitized by *T. trichiura* also showed the disappearance of eggs in 12·50%; the others showed only a reduction in the number of eggs.

"Piperazine adipate showed no effect on two cases of *H. nana* infection."

BROWN, H. W., CHAN, Kam-Fai & HUSSEY, Kathleen L. **Treatment of Enterobiasis and Ascariasis with Piperazine.** *J. Amer. Med. Ass.* 1956, June 9, v. 161, No. 6, 515-20. [15 refs.]

The authors have investigated the use of different dosage schedules in the treatment of enterobiasis and ascariasis by piperazine derivatives

giving consideration to effectiveness, simplicity, freedom from side effects and cost. They conclude that for enterobiasis piperazine citrate, which in aqueous solution is changed to piperazine hexahydrate, given in a single course lasting 7 days, will cure 97 per cent. of infections. The drug is administered in a single daily dose before breakfast in the form of a flavoured syrup (Antepar) containing the equivalent of 100 mgm. of piperazine hexahydrate per ml. of syrup. The following table sets out the daily dose:—

<i>Weight of child</i>	<i>Equivalent Piperazine Hexahydrate mgm.</i>		
Up to 15 lb. (up to 7 kgm.)
From 16–30 lb. (7–14 kgm.)	500
From 31–60 lb. (14–27 kgm.)	1,000
Over 60 lb. (over 27 kgm.)	2,000

For ascariasis a two-day course with the following daily dosage is recommended:—

<i>Patient's weight</i>	<i>Equivalent Piperazine Hexahydrate gm.</i>		
30–50 lb. (14–23 kgm.)	2·0
50–100 lb. (23–46 kgm.)	3·0
Over 100 lb. (over 46 kgm.)	3·5

The syrup is given after breakfast without any special dietary regimen. It is estimated that 94 per cent. of patients may be cured by this treatment.

The worms are usually passed alive but relaxed, during or within a day or two of treatment.

The great majority of patients tolerate these doses well; mild nausea, vomiting and urticaria may occur rarely. Caution is required in patients with chronic nephritis as neurological side effects, such as may occur with overdosage, may follow deficient elimination in the urine.

The following helminths were not found to be amenable to piperazine treatment: *Necator americanus*, *Strongyloides stercoralis*, *Trichuris trichiura*, *Hymenolepis nana*, and *Giardia intestinalis*.

Adult *Trichinella spiralis* are removed from mice by piperazine so its use in trichinosis might be tried.

Frederick J. Wright

WECHSELBERG, K. Zur Verträglichkeit des Piperazins. [The Toxicity of Piperazine] *Deut. med. Woch.* 1956, Apr. 20, v. 81, No. 16, 632, 637–9. [31 refs.]

Enterobiasis is still very common in Germany. In children's clinics in Lübeck the frequency of enterobiasis is said to be 87 per cent. and in orphanages it may be 100 per cent. In the past treatment has been difficult and unsatisfactory. Consequently much interest has been taken in the recent introduction of piperazine for this purpose. Half a century

ago piperazine used to be employed for the treatment of gout, and there are various reports about its possible toxic effects. Doses of 6 gm. caused no disturbance of kidney function. In one patient with nephritis it seemed to cause albuminuria; but this was later shown to be due to an artefact, because the piperazine excreted in the urine caused a precipitate in the picric acid reaction then used to detect protein. Other observers reported headache and vomiting after doses of 2·5 gm. In one patient, who had received 1 gm. on the first day, 1·6 gm. on the 2nd to 4th days and 4·6 gm. on the 5th day, there was a syndrome which included clonic spasms of the arms, abdomen and thighs, mental dullness and transient loss of consciousness, severe muscular weakness and incoordination; after 30 hours these symptoms disappeared. Several other such cases have been reported. One woman who had swallowed 1·3 gm. went into a state of semi-coma, with cyanosis and paralysis of the legs. Since its introduction in 1950 as an anthelmintic, many authors have emphasized the innocuousness of piperazine when given in daily doses of 75–120 mgm./kgm.; but WHITE and STANDEN [this *Bulletin*, 1954, v. 51, 423] mention untoward effects including giddiness, disturbance of coordination and of sight, and a sensation of disembodiment. Some cases in the literature seem to be due to overdosage (*e.g.*, 6 gm. daily), others to hypersensitivity.

The present author describes 3 cases.

Case 1—A child 3 years old drank a bottle containing 12 gm. piperazine citrate. In half an hour vomiting began and lasted over 12 hours. The child could not stand and its movements were incoordinated. Next day there was anorexia, pain in body and head, apathy and unsteadiness in standing and walking, a tendency to fall to the right, weakness. Electroencephalograms taken 2 days after the poisoning showed severe generalized dysrhythmia. Three days after poisoning the child appeared normal again.

Case 2—A child of 3 years swallowed 11·4 gm. piperazine adipate. An hour later its stomach was washed out and part of the drug was recovered. There were no discernible clinical symptoms, but an electroencephalogram taken at 24 hours showed moderate dysrhythmia with a suspicion of convulsive activity. These subsided after another day.

Case 3—A girl of 4½ years had been admitted for right-sided facial paralysis following poliomyelitis 3 weeks earlier. A week after admission she was treated for ascariasis with piperazine citrate, 1 teaspoonful of a preparation called Tasnon 4 times daily. This was double the normal dose. On the 4th day of treatment, the child suddenly became sleepy. There were also disturbances of sight, general muscular hypotonia, loss of reflexes and signs of meningismus. The stomach was washed out, castor oil was given and so were glucose solution and analeptics. The symptoms rapidly subsided after 12 hours and had disappeared in 3 days.

It is concluded that in addition to the non-specific symptoms (vomiting, giddiness and abdominal pains), the other symptoms (muscular weakness

especially in the thighs, incoordination, ataxia, and disturbances of equilibrium and of consciousness) are characteristic of piperazine and they suggest an action on the cerebrum and cerebellum. This view is supported by the changes in the electro-encephalogram. In 200 other children no serious effects were observed. The author considers piperazine quite a safe treatment for worms in children, but they should be kept under observation by their parents, and piperazine should not be given during illness of the central nervous system. [This article contains a valuable review of the toxic effects which may possibly be produced by overdosage with piperazine.]

F. Hawking

NORMAN, Lois, DONALDSON, A. W. & SADUN, E. H. **The Flocculation Test with a Purified Antigen in the Diagnosis of Trichinosis in Humans.** *J. Infect. Dis.* 1956, Mar.-Apr., v. 98, No. 2, 172-6. [10 refs.]

BOZICEVICH and his colleagues [see this *Bulletin*, 1952, v. 49, 431; 1953, v. 50, 750] described the preparation of a *Trichinella spiralis* antigen prepared from whole larvae, which could be used for flocculation and complement-fixation tests, and showed that both tests were capable of detecting infections in rabbits, but that the former test had certain advantages as regards speed and simplicity. MELCHER [*ibid.*, 1944, v. 41, 225] isolated a serologically active, acid-soluble protein fraction of *T. spiralis* larvae which gave satisfactory results when used to detect, by means of a flocculation test, *T. spiralis* infections in rabbits. The authors of the present paper tested 1,331 human sera (from about 1,200 patients) with the flocculation test, using the protein-soluble fractions of *Trichinella* larvae, and with the complement-fixation test, using ground-up whole larvae.

The authors' summary is as follows:—

"Bentonite flocculation tests with an acid soluble protein fraction antigen and complement-fixation tests with a crude larval antigen gave comparable results in 1331 human serums. The results of the two tests in 206 patients were compared with observations made on clinical grounds, and with other laboratory findings. A mutual relationship between serological findings and clinical trichinosis was observed."

"On the basis of the results of this work and in view of ease of performance, it is believed that the flocculation test can be used instead of the complement-fixation test for the serological diagnosis of trichinosis in human beings."

[This paper contains a considerable amount of information which does not lend itself to further summarization; the original should be consulted by those interested.]

R. M. Gordon

DEFICIENCY DISEASES

BRAVO OLIVA, J. Alimentación en el trópico. Enfermedades carenciales más frecuentes. [Nutrition in the Tropics. Some Common Diseases due to Malnutrition] *Med. Colonial.* Madrid. 1956, June 1, v. 27, No. 6, 511-41.

This is a general discussion, with a number of references to the literature, on malnutrition in tropical countries. The author, from the *Instituto Español de Medicina Colonial*, begins with general comment on the effects of tropical climates on nutritional requirements and the physiology of metabolism and discusses the various essential dietary elements in relation to various meteorological and topographical factors. Special reference is given to reduction in calories and to protein deficiencies.

He then goes on to outline basic food requirements and sets out briefly some of the natural foodstuffs utilized by different peoples in Africa, in Asia and Oceania, and in the West Indies and South America.

The nutritional requirements of infants and children are then surveyed, with observations on maternal and cows' milk. This is followed by a short note on the effects on health of inadequate diets.

Finally the author gives a condensed account of the incidence, nature, pathology, clinical features and treatment of some common diseases resulting from insufficient or unsuitable feeding. The conditions discussed are sprue, kwashiorkor, hunger oedema, epidemic dropsy, pellagra and beri-beri.

[The value of the survey of the literature is reduced by the fact that of some 30 references cited in the text, only 2 can be identified in the brief bibliography of 8 entries at the end of the paper.]

H. J. O'D. Burke-Gaffney

GANDRA, Y. R. Inquérito sobre o estado de nutrição de um grupo da população da cidade de São Paulo. I—Planejamento, padronização e organização; coletividade estudada. *Arquivos Facul. de Hig. e Saúde Pública Univ. de São Paulo.* 1954, Dec., v. 8, No. 2, 193-216. English summary. II—Investigações sobre a ocorrência de hipovitaminose A. *Ibid.*, 217-60, 6 coloured figs. & 5 graphs. [28 refs.] English summary. III—Investigação sobre a ocorrência de hipovitaminoses do Complexo B (tiamina, riboflavina e niacina). *Ibid.*, 1955, June-Dec., v. 9, Nos. 1/2, 29-112, figs. 7-17 (10 coloured) & graphs 6-14. [61 refs.] English summary. [Nutritional Survey on a Population Group in the City of São Paulo. I. Organization and Scope. II. Study of the Incidence of Vitamin A Deficiency. III. Study of the Incidence of Deficiency of Vitamin B Complex]

ZIELHUIS, R. L. **Enlargement of the Heart to the Right and Nutritional Deficiency.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1956, June, v. 8, No. 2, 179-84. [15 refs.]

In examinations of Indonesian and Chinese workers and their families, enlargement of the heart to the right was a common finding. The enlargement was assessed by percussion, X-ray examination being impossible. It is suggested that this finding is evidence of a mild deficiency of vitamin B1. A plea is made for a more detailed study of the circulatory system in clinical nutrition surveys. *R. Passmore*

SIMPSON, I. A. & CHOW, A. Y. **The Thiamine Content of Human Milk in Malaya. Part I. The "Normal" Level of Thiamine in Milk from Malay, Chinese and Indian Women.** *J. Trop. Pediatrics.* London. 1956, June, v. 2, No. 1, 3-17, 1 fig. [21 refs.]

The first part of the paper discusses the technical difficulties of the thiochrome method of assay as applied to human milk. No evidence could be found for an artefact giving high readings, resulting from the use of pepsin and taka-diastase in the extraction process.

The mean level of thiamine in 91 samples of full lactation milk from Malay, Chinese and Indian women was 11.3 µgm./100 ml. (range 3-20 µgm./100 ml.). There was no difference in the milk from women of the 3 races, nor in women of different parity. This mean is lower than means for the milk of United Kingdom women (14.7-18.3), U.S.A. women (14.8 and 20.1) and Australian women (12.9), reported in the literature.

Samples of milk collected during the first month after parturition had a lower thiamine content, which gradually reached normal at about the end of the first month of lactation. *R. Passmore*

BASSIR, O. **Nutritional Studies on Breast Milk of Nigerian Women. Some Biochemical Features of Breast Milk of Lagos Women during the First Year of Lactation.** *J. Trop. Med. & Hyg.* 1956, June, v. 59, No. 6, 138-44, 3 figs. [23 refs.]

The breast milk from 186 women selected at random from the Lagos public has been analysed. The mean figures obtained were:— cream 5.87 per cent.; protein 1.6 per cent.; lactose 7.2 per cent.; calcium 20.3 mgm./100 ml.; phosphorus 9.5 mgm./100 ml.

For cream, protein and lactose, these figures do not differ from those of similar surveys in Europe and America. The calcium and phosphorus content was significantly lower, but the calcium/phosphorus ratio was similar to that in other studies. There was no evidence of rickets in the children. Once lactation was fully established, the chemical composition of the milk appeared to have remained practically unchanged for 12 months. *R. Passmore*

WALLACE, Barbara V., BERSOHN, I. & WAYBURNE, S. **The Antithrombin Titre in Malignant Malnutrition.** *South African J. Lab. & Clin. Med.* 1956, Mar., v. 2, No. 1, 89-94. [15 refs.]

In fibrocystic disease of the pancreas, depressed levels of serum antithrombin have been reported. As atrophy of the pancreatic acinar cells occurs in kwashiorkor [this *Bulletin*, 1948, v. 45, 633], it was decided to measure antithrombin titre in this condition. In a study on 66 African patients, values were found to be normal on admission, to rise during treatment but to return to normal before discharge. The nature of this change remains unsolved.

R. Passmore

PRETORIUS, P. J., HANSEN, J. D. L., DADEL, J. G. A. & BROCK, J. F. **Skimmed Milk and Kwashiorkor.** *South African Med. J.* 1956, May 12, v. 30, No. 19, 447-50, 1 fig. [16 refs.]

This paper records further studies on the therapy of kwashiorkor with the standard technique developed in South Africa [this *Bulletin*, 1956, v. 53, 231]. Skimmed milk is again shown to be a very effective form of treatment. Vitamin or protein supplements added to the skimmed milk do not increase its efficiency in the initiation of a cure. Significantly better results were obtained during treatment with imported spray-dried acidified skimmed milk than with South African rolled dried skimmed milk. High standards of preparation, packaging and storage are essential if widespread distribution of skimmed milk is to be fully effective.

R. Passmore

MACKAY, I. F. S., PATRICK, S. J., STAFFORD, Doreen & CLEVELAND, F. S. Jr. **The Influence of Vitamin B₁₂ and Aureomycin upon the Growth of Protein-Deficient Children.** *J. Nutrition.* 1956, May 10, v. 59, No. 1, 155-70. [26 refs.]

The children studied lived in small rural communities in Jamaica. Lime-flavoured troches which contained either (1) no growth factor or (2) 100 µgm. of vitamin B12 or (3) 50 mgm. of aureomycin or (4) 100 µgm. of vitamin B12 and 50 mgm. of aureomycin were given to 955 schoolchildren each day at school. Measurements of height and weight, a clinical assessment and a study of the blood proteins were made. Although the nutritional state of these children was low, vitamin B12 supplements had no effect on gain of either height or weight. Aureomycin supplements were associated with a very slight increase in weight over controls, but no increase in height. There was no change in the blood picture. It is concluded that there is no evidence that these supplements would be of practical value in alleviating malnutrition in the Caribbean. [This study has been carried out with meticulous attention to detail and on a large scale. There is every reason to consider that the conclusion drawn is widely applicable.]

R. Passmore

IGLESIAS BETANCOURT, P., LEÓN BLANCO, F., MUÑIZ CANO, R., MORFFI, R. & ILIZASTEGUI, F. Sobre algunos casos de hemocromatosis nutricional o citosiderosis. [Some Cases of Nutritional Haemochromatosis and Cytosiderosis] *Archivos Hospital Universitario*. 1955, Nov.-Dec., v. 7, No. 6, 411-26, 10 coloured figs. on pl. [13 refs.]

An account of 11 cases.

HAEMATOLOGY

STRANSKY, E. & REYES, A. Refractory Anaemia in the Philippines. *J. Trop. Pediatrics*. London. 1956, June, v. 2, No. 1, 43-6. [18 refs.]

Between 1951 and 1954, 38 cases of refractory anaemia were observed occurring in children and adults at the Philippines General Hospital. More or less complete atrophy of the bone-marrow with absent or very poor erythrocytic activity was found in these patients. The authors conclude that such aplastic anaemias are not uncommon in the tropics. It is suggested that long-standing iron deficiency may lead to a sudden breakdown of the bone-marrow.

R. Passmore

NEEL, J. V. The Genetics of Human Haemoglobin Differences: Problems and Perspectives. *Ann. Human Genetics*. 1956, July, v. 21, Pt. 1, 1-30. [Numerous refs.]

A general review and discussion.

LEHMANN, H. & SUKUMARAN, P. K. Examination of 146 South Indian Aboriginals for Haemoglobin Variants. Reprinted from *Man*. 1956, 97.

The authors refer briefly to the findings of different haemoglobins in Indians, with which readers of this *Bulletin* will be familiar.

They have now studied the blood of 146 aborigines from Southern India by electrophoresis. The subjects belonged to 5 different communities and evidence of sickling was found in 4, namely the Badagas (2 positive), Irulas (4), Kurumbas (7) and Todas (1): the number of subjects examined in each of these communities were respectively 30, 18, 26 and 50.

In every case where the sickle-cell test was positive, electrophoretic analysis showed the haemoglobin to be a mixture of sickle-cell and normal adult haemoglobin. No variants of normal adult haemoglobin other than sickle-cell haemoglobin were found.

H. J. O'D. Burke-Gaffney

BRAIN, P. **The Sickle-Cell Phenomenon.** *Central African J. of Med.* 1956, Feb., v. 2, No. 2, 73-7, 1 fig. [40 refs.]

A general review and discussion.

See also p. 1312, MILLER *et al.*, **Distribution of Parasites in the Red Cells of Sickle-Cell Trait Carriers infected with Plasmodium falciparum.**

CHAZAN, A. A. & McSORLEY, J. G. A. **Haemolytic Anaemia in Sickle-Cell Trait.** *Brit. Med. J.* 1956, Aug. 4, 283-4.

The haemolytic episode developed during a superadded infection [see also EDINGTON and LEHMANN, this *Bulletin*, 1955, v. 52, 821].

ZARAFONETIS, C. J. D., McMMASTER, J. D., MOLTHAN, L. & STEIGER, W. A. **Apparent Renal Defect in Sicklemic Individuals.** *Amer. J. Med. Sci.* 1956, July, v. 232, No. 1, 76-82, 4 figs. [17 refs.]

" 1. Renal function studies were performed in 16 patients with sickle cell anemia, 33 with sickle cell trait, 2 with mixed sickle cell trait-thalassemia trait, and 1 with mixed sickle cell and hemoglobin C traits.

" 2. Mean values for the clinical tests of renal function were well within limits of normal for all groups.

" 3. Limited ability to excrete a concentrated urine after fluid deprivation for 18 hours was the most striking finding.

" 4. This defect was more pronounced in sickle cell anemia than in sickle cell trait subjects: the mean maximum urine osmotic pressure was 421 mOsm. per liter in the former, and 604 mOsm. per liter in the latter.

" 5. Reasons for considering the lesion to be renal, of physiologic or metabolic nature, and inheritable as part of the sicklemic state are presented."

CABANNES, R., SENDRA, L. & DALAUT. Hémoglobinose D. Anomalie hémoglobiniqne héréditaire retrouvée chez l'Algérien Musulman. Observations de deux familles. [**Haemoglobin D in Two Muslim Families in Algeria**] *Algérie Méd.* 1955, June, v. 59, No. 6, 387-95, 5 figs. [10 refs.]

LIE-INJO LUAN ENG. Penjelidikan hemoglobin patologik di Indonesia. [**Research on Haemoglobin Pathology of Indonesia**] [Thesis]. 154 pp., 23 figs. [182 refs.] English summary. 1956. Djakarta: Universitas Indonesia.

This thesis provides well worth while reading for anyone interested in the haemoglobinopathies. The exhaustive list of references alone would

make it a useful tool. There is an English summary, but most of the numerous tables and illustrations can be comprehended without a knowledge of the Indonesian language.

A general survey of the abnormal haemoglobins constitutes the introduction. The bulk of the thesis concerns itself with haemoglobin E which the author was the first to find in Indonesia [this *Bulletin*, 1955, v. 52, 1227]. Fifteen family studies are recorded. One of them is the first in which the finding of a homozygote for haemoglobin E is demonstrated in that way, in addition to the deductions from observations in the laboratory on the blood of the propositus. Both parents and one sibling carried the haemoglobin E trait. Homozygous haemoglobin E disease and haemoglobin-E:thalassaemia were seen in 2 and 8 cases respectively. Of particular interest is the discovery in a part Chinese, part Indonesian subject of what seems to be haemoglobin H. As in all other instances described so far (one of them also in a Chinese family in the U.S.A.) the parents did not show the haemoglobin.

There is also a study of thalassaemia major and minor in Indonesia. Observations have been made on the incidence and level of foetal haemoglobin in infants and adults. No increased alkali-resistant haemoglobin was found above the age of $2\frac{1}{2}$, except in cases of thalassaemia.

[This seems to be such an excellent monograph that one hopes that the author will take steps to get it translated into English, and thus make it available to the wide public it deserves.]

H. Lehmann

HANLON, D. G. & BAYRD, E. D. **Hereditary Leptocytosis (Thalassemia Minor).** *J. Amer. Med. Ass.* 1956, July 21, v. 161, No. 12, 1132-5, 1 fig.

VENOMS AND ANTIVENENES

GRASSET, E., PONGRATZ, E. & BRECHBUHLER, T. Analyse immunochimique des constituants des venins de serpents par la méthode de précipitation en milieu gélifié. [Analysis of the Components of Snake Venoms by Agar Diffusion] *Ann. Inst. Pasteur.* 1956, Aug., v. 91, No. 2, 162-86, 7 figs. on 3 pls. [38 refs.]

The English summary appended to the paper is as follows:—

"The authors applied Ouchterlony's double diffusion method to the study of venoms and anti-venomous sera. They were able to demonstrate the presence of series of lines of precipitation, which correspond to different antigenic constituents of *Viperidae* and *Elapidac* venoms.

" By this method, the antigenic constituents of different venoms can be compared. Thus, it is possible to determine which antigenic constituents are common to several venoms and which are absent or different. One is able to appreciate the degree of relationship which may exist between these venoms.

" For a given venom in the presence of an homologous serum, the number of lines of precipitation (which correspond to at least the same number of distinct antigens) is often greater than the number of fractions of the same venom which can be separated by electrophoresis.

" These specific and highly sensitive immunologic methods allow the precise study of the antigenic constitution of venoms. In practice, they permit to appreciate the degree of relative protection (by group neutralisation) that a non homologous serum may exert against a venom of known constitution. A micromethod is described, which, by the use of purified antivenomous sera, gives very accurate results."

LIVREA, G., with the collaboration of G. PETTI. Studio comparativo dell'emolisi *in vitro* da veleno di *Vipera ammodytes* su 73 specie di vertebrati e sua importanza per l'avanzamento della conoscenza dell'ultrastruttura della membrana eritrocitaria. [Comparative *in vitro* Studies of *Vipera ammodytes* Venom in 73 Species of Vertebrates and its Importance for the Knowledge of the Ultra-Structure of the Red-Cell Membrane] *Ann. di Med. Nav. e Trop.* 1954, May-June, v. 59, No. 3, 209-35. [50 refs.] English summary.

DI EGIDIO, M. Piede da morso di *Atractaspis microlepidota*. [Bite by the Viper *Atractaspis microlepidota*] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1956, July, v. 37, No. 7, 373-8, 4 figs. [11 refs.]

The English summary appended to the paper is as follows:—

" There is described a non-lethal case of bite by the *Atractaspis microlepidota*, common viper in the mountain zone of the Yemen.

" The patient, a cultivator, aged 60, living in Taiz, had the signs of general poisoning, which disappeared after two days without treatment.

" At the site there was necrosis, the loss of a toe and a radiological shadow of a rapid and diffused osteolysis.

" This clinic-radiological finding of bite by *Atractaspis microlepidota* probably we see only when, on the anergic tissues at the sites of injury, there is microbial infection."

BELFIELD, W. A Preliminary Check List of the West African Scorpions and Key for their Identification. *J. West African Sci. Ass.* 1956, Feb. 1, v. 2, No. 1, 41-7, 11 figs.

ABALOS, J. W. *Bothriurus bertae* sp. n. (Bothriuridae, Scorpiones).
[*Bothriurus bertae, a New Species of Scorpion*] *An. Inst. Med. Regional.* Tucuman, Argentina. 1955, Dec., v. 4, No. 2, 231-39, 16 figs. English summary (6 lines).

_____. *Tityus birabeni* sp. n. de Bolivia (Buthidae, Scorpiones).
[*Tityus birabeni, A Species of Scorpion Newly Recorded in Bolivia*] *An. Inst. Med. Regional.* Tucuman, Argentina. 1955, Dec., v. 4, No. 2, 223-30, 17 figs. English summary (5 lines).

MUJČ, N., STANIĆ, M. & MENIGA, A. Beitrag zur Kenntnis des Spinnen-giftes von *Latrodectus tredecimguttatus* Rossi. [**Observations on the Venom of Latrodectus tredecimguttatus**] *Hoppe-Seyler's Ztschr. physiol. Chem.* 1956, v. 305, Nos. 2/3, 70-74, 3 figs. [10 refs.]

The English summary appended to the paper is as follows:—

"A modified method for the collection of spider venom is described. Six protein constituents with different electrophoretic mobilities were distinguished when the venom of *Latrodectus tredecimguttatus* Rossi was examined by electrophoresis. Two further constituents which could only be stained with ninhydrin were detected by paper chromatography. The immune serum against *Latrodectus* toxin was analysed electro-phoretically."

GAJARDO-TOBAR, R. Die spezifische Natur der Antiseren gegen Spinnen-gifte. [**Specificity of Antisera against Spider Venom**] [Miscellanea]. *Acta Tropica.* Basle. 1956, v. 13, No. 1, 82-5.

The author records two cases of illness due to the bite of *Latrodectus mactans* (the black widow spider) cured by treatment with serum prepared against the venom of *L. tredecimguttatus*. In both cases the patient was bitten on the buttock, and apart from the immediate discomfort of the bite, had no symptoms for about 15 minutes. Severe pain then developed in the buttocks and waist region and radiated to the abdomen, with steadily increasing severity. This was followed by pains in the legs, rigidity of the abdomen, dyspnoea, severe headache and vomiting. Cramps and profuse sweating prevented sleep. One patient was given 5 ml. of antiserum 10 hours after the bite, and a further 5 ml. 10 hours later; the other (who showed a striking localized oedema of the eyelids) received 5 ml. of antiserum 19 hours after the bite. Both recovered rapidly and completely. [See also this *Bulletin*, 1954, v. 51, 103, 104.]

C. L. Oakley

PRINCE, G. E. **Arachnidism in Children.** *J. Pediatrics.* St. Louis. 1956, July, v. 49, No. 1, 101-8. [23 refs.]

" 1. The subject of black widow spider poisoning has been reviewed, and five cases of this illness as it occurs in children have been presented.

" 2. The expiratory grunt was a constant finding in these children as well as abdominal pain and rigidity of the abdominal wall.

" 3. Calcium gluconate and *Latrodectus mactans* antivenom were found to be agents most useful in the treatment of this illness.

" 4. Specific antivenom is supplied in a dry form which is stable for several years. Every doctor who might be called upon to treat a patient with arachnidism should be certain that the antivenom is readily available in his community."

TOXOPLASMOSIS

SCHUHOVÁ, Věra, with E. BONNOVÉ, J. HÜBNERA & Z. ŠAŠKOVÉ. Pasážování *Toxoplasma gondii* na he-la buňkách. [**Serial Propagation of Toxoplasma gondii in Stationary Tube Cultures of He-La Cells**] *Českoslov. Epidemiol., Mikrobiol., Imunol.* Prague. 1956, v. 5, No. 3, 161-3, 6 figs. on pl. [12 refs.]

The English summary appended to the paper is as follows:—

" Stationary tube cultures of He-La cells have been used for serial passages of *Toxoplasma gondii* strain CB. The cultures were inoculated by free extracellular parasites in the medium or the inoculum was enriched by parasites liberated from the tissue by means of trypsin. Intracellular occurrence of parasites was observed either in vacuoles, sometimes in rosette like formations, or in pseudocysts. The number of extracellular parasites increased in subsequent passages due to adaptation of the parasite to the host cell."

ROGER, F. L'isolement de la souche reste le seul critère indiscutable d'identification du toxoplasme lorsque le diagnostic doit être posé sur des pièces d'autopsie. [**Isolation of the Organism is the only Certain Criterion in Toxoplasmosis when diagnosis is to be made from Autopsy Specimens**] *Bull. Soc. Path. Exot.* 1956, Mar.-Apr., v. 49, No. 2, 239-41.

POKORNÝ, B. Příspěvek k poznání toxoplasmosy polní zvěře. [**A Contribution to the Study of Toxoplasmosis in Wild Animals**] *Českoslov. Parasit.* Prague. 1955, v. 2, 157-60, 4 figs. on 2 pls. [27 refs.] German summary.

Evidence of toxoplasma infection was found in 5 of 38 hares found dead in the neighbourhood of Prague, Pilzen and Hradec Kralový in

Czechoslovakia. The spleen was enlarged, the liver was engorged, with focal necroses, and there was generalized lymphadenitis; pseudocysts were found in smears of lungs and spleen. No signs of infection were found in 41 hares caught in healthy condition. Pseudocysts were also found in the spleens of 3 of 24 dead partridges. The positive findings were all obtained between November and May and the author suggests that toxoplasmosis exists as a latent infection which is provoked into activity by unfavourable climatic conditions.

D. J. Bauer

LAINSON, R. Toxoplasmosis in England. III.—*Toxoplasma Infection in Dogs: the Incidence of Complement-Fixing Antibodies among Dogs in London.* *Ann. Trop. Med. & Parasit.* 1956, June, v. 50, No. 2, 172–86. [Numerous refs.]

The sera of 113 London dogs were tested by the complement-fixation reaction for toxoplasmosis and 48 gave positive tests at a dilution of 1 in 8. One out of 4 country dogs' sera was also positive. Symptoms of unknown aetiology appeared to bear no relationship to the presence of the antibodies. Out of 14 London dogs 4 were found to be infected with helminths. In 2 of the dogs the helminths found indicated that raw flesh had been eaten. The 2 dogs concerned had antibodies for toxoplasms, and it is inferred that more town dogs may become infected with toxoplasms as a result of eating raw flesh than is usually thought. A puppy inoculated with toxoplasms showed parasitaemia for one week. It remained entirely symptomless, however, but when killed 4 months later the organisms were readily isolated from the brain, lung and other viscera. The dog, therefore, may be an important reservoir of infection for man although how such infection might be transferred to man is not clear.

I. A. B. Cathie

DERMATOLOGY AND FUNGUS DISEASES

KEMPER, H. Experimentelle Untersuchungen über die Wirkung von Raupenhaaren auf die menschliche Haut. I. *Arctia caja* und *Dasychira pudibunda*. [Experimental Studies of the Effect of Caterpillar Hairs on the Human Skin. I. *Arctia caja* and *Dasychira pudibunda*] *Ztschr. f. Angewandte Zool.* 1956, No. 1, 103–14, 6 figs.

MACAULAY, W. L. Is Cutaneous Blastomycosis a Systemic Disease? A Defense of the Fading Concept that Cutaneous Blastomycosis is a Primary Inoculation Process. *Arch. Dermat.* 1956, June, v. 73, No. 6, Sect. 1, 560–63, 2 figs.

A localized lesion of North American blastomycosis, of 18 months' duration, on the dorso-mesial aspect of the left great toe of a man aged

25 years, yielded to stilbamidine administered by slow intravenous drip in daily doses of 110 mgm., increased after a few days to 225 mgm., the total dosage being 3·035 gm. in 13 days.

No lesion of blastomycosis was found elsewhere in the body, and an X-ray examination of the chest showed nothing abnormal in the lungs. The author therefore concluded that the lesion on the toe was a primary lesion developing in the site of infection. The patient's history showed that this lesion had started as a blister which developed as a result of wearing, on one occasion, an ill-fitting basketball shoe belonging to an unidentified person. On the following day the toe was injured and the blister ruptured during the man's work in a grain elevator. Thereafter the lesion did not heal and, in time, it assumed the character of the blastomycotic ulcer. The author considers that the shoe or the elevator dust may have been the source of the infection. He contends that the original view that blastomycosis was often a primary cutaneous disease with occasional haematogenous dissemination leading to the systemic form was abandoned too hastily, and he pleads for a re-examination of the whole problem of infection by *Blastomyces dermatitidis* before accepting the hypothesis that the lung is the usual portal of the infection.

[This question has been dealt with adequately by WILSON *et al.* (this *Bulletin*, 1955, v. 52, 482).]

J. T. Duncan

KUHN, Beatrice H. **Stilbamidine-Resistant North American Blastomycosis.** *Blastomyces Vaccine Treatment.* *Arch. Dermat.* 1956, June, v. 73, No. 6, Sect. 1, 556-9. [13 refs.]

The author reviews the literature bearing on the treatment of North American blastomycosis with the aromatic diamidines, and shows that although very impressive cures have been effected by the administration of stilbamidine or 2-hydroxystilbamidine, the treatment has failed in a number of cases, and in stilbamidine therapy there is a risk of minor toxic complications. [Reports on this form of therapy have been reviewed in this *Bulletin*, 1956, v. 53, 492, and other references given there.]

In the case described in the present report the patient, a woman aged 37, suffered from blastomycotic lesions on both legs. She showed intolerance of iodides administered by mouth, but local treatment by X-rays and applications of Sopronol (a propionate-caprylate compound), iodine and antibiotics caused clinical improvement until the course of pregnancy seemed to provoke a recrudescence of the disease. In the following year stilbamidine was given by intramuscular injection in doses of 100 mgm. in 2 ml. of procaine solution [daily?] to a total of 4·3 gm. without beneficial effect. Intravenous administration of the drug was contra-indicated because it provoked "acute vascular collapse".

Blastomyces vaccine is generally employed merely to reduce a state of specific hypersensitivity before starting chemotherapy, but in the present case the vaccine, prepared at the Duke University School of Medicine,

was administered over a long period as a curative measure, beginning about a year after the failure of stilbamidine therapy. The undiluted vaccine was given intramuscularly at weekly intervals, with a starting dose of 0·1 ml. increasing to 1·0 ml. At this dose and interval the treatment was maintained for a year and then, with the same dose, the intervals were increased to 2 weeks, 3 weeks and finally 4 weeks.

Improvement was shown by a negative biopsy examination 3 months after vaccine therapy had been started, and since then there has been no evidence of active disease. Nevertheless, the vaccine injections were continued up to the time of publication of this report—a period of 2 years.

J. T. Duncan

LACAZ, C. da S., STERMAN, L., MONTEIRO, E. V. L. & PINTO, D. O. Blastomicose queloideana. Comentários sobre novo caso. [A New Case of Keloid Blastomycosis] Reprinted from *Rev. Hosp. Clínicas*, 1955, July-Aug., v. 10, No. 4, 254-64, 5 figs. [31 refs.]

The English summary appended to the paper is as follows:—

"The 12th case of keloid blastomycosis is reported. The patient, a male, 23 years of age, lived in Manáus, the capital of the state of Amazonas, Brazil. The biopsy of a cutaneous lesion showed great number of organisms and an infiltration consisting mainly of S.R.E. cells. The organisms were well colored by McManus-Hotchkiss method. Catenary forms were abundant in the tissue, but peripheral buds were not seen. Cultures were negative and animal inoculations in guinea pigs and in hamsters were also negative. The infections developed in allantochorion of the chick embryos. Complement fixation test with a polysaccharide of *Paracoccidioides brasiliensis* was negative.

"The literature about keloid blastomycosis is reviewed in detail and the differential diagnosis with South American blastomycosis is discussed. The keloid blastomycosis or Jorge Lobo's disease is considered an autonomous disease caused by a new species of *Paracoccidioides-Paracoccidioides Loboi*."

[See this *Bulletin*, 1954, v. 51, 110.]

TROPICAL OPHTHALMOLOGY

THOMSON, I. G. Eye Disease and Blindness in relation to Vitamin A Deficiency in Northern Nigeria. *J. Trop. Med. & Hyg.* 1956, July, v. 59, No. 7, 155-61. [11 refs.]

The author gives an account of eye disease and blindness found in the population of Kankiya, in Katsina province, Nigeria. He examined 84 per cent. of the population.

The commonest eye disease was simple acute conjunctivitis, from which no less than 5 per cent. of the population was suffering at the time of the examination. Corneal scars were the second most frequent condition met with and trachoma was third, being found in 3 per cent. of the population. Those with less than 3/60 vision were recorded as blind. On this basis it was found that 1·2 per cent. of the population were blind in both eyes and 3·4 blind in one or both eyes. Infectious eye disease accounted for 81 per cent. of the cases of complete blindness for which simple acute conjunctivitis, smallpox and trachoma were almost entirely responsible. This was compared with a rate of 12·3 per cent. for the United Kingdom. Bitot's spots were noted in only 0·3 per cent. but xerophthalmia was present in 21 per cent. with particular frequency in the age-group 7 to 14 years. Generalized xerosis of the skin and pachyderma were noted.

The conclusion was reached that xerophthalmia predisposed to the high incidence of eye disability, including blindness, by lowering the resistance of the eye to infection. The author concludes by discussing how the prevention of eye disease could be secured by: (a) improved family hygiene; (b) early efficient treatment; (c) control of fly breeding; (d) vaccination against smallpox; (e) improved standard of nutrition with special reference to vitamin A and perhaps to a lesser extent vitamin B₂ complex.

It is well known that ocular diseases due to nutritional deficiency vary greatly from locality to locality, as illustrated by the fact that keratomalacia, which is extremely common in some parts of the world such as India and Malaya, was seen only once in this survey.

The various findings are set out in detail in 4 tables. [See also NICOL, this *Bulletin*, 1950, v. 47, 151.]

D. P. Choyce

BIETTI, G. Some Contributions to the Problems of Trachoma. *Rev. Internat. du Trachome.* 1956, v. 33, No. 2, 201-28. [62 refs.]

In this lecture delivered at the University of California, the author, who is Professor of Ophthalmology in Rome, reviews fully the studies on trachoma undertaken by himself and his colleagues during the last 25 years.

He discusses first the epidemiology of trachoma and the influence of age, sex, race, nutritional state and pre-existing ocular conditions. While he agrees that trachoma attacks the undernourished, he finds no evidence that malnutrition as such has a part in the development of the disease. He does not consider that there is necessarily a connexion between acute bacterial conjunctivitis and trachoma, even though both commonly occur together or in sequence: indeed in Italy and other countries it was often noted that bacterial conjunctivitis rarely preceded trachoma.

The author then discusses the aetiology and experiments on cultivation of the virus. Degenerative changes in the inclusion bodies have been found to follow treatment with many antibiotics. This, together with the

susceptibility of the agent of trachoma to sulphonamides but not to paraaminobenzoic acid, distinguishes it from the rickettsiae and many viruses, but suggests its relationship to the lymphogranuloma-psittacosis group: this last point is underlined by the serological cross-reactions found.

The onset of the disease, its clinical similarities in families and within geographic groups—and also the differences within these groups—are discussed.

Finally, treatment is surveyed at some length, with special reference to sulphonamides and antibiotics. The value of depot penicillin, especially for mass treatment, is stressed.

There is a very full bibliography of the Italian literature, mostly relating to work by the author and his colleagues [see, for example, this *Bulletin*, 1954, v. 51, 641; 1955, v. 52, 1142; 1956, v. 53, 495].

H. J. O'D. Burke-Gaffney

MITSUI, Y., TANAKA, C., YAMASHITA, K. & HANABUSA, J. **Erythromycin (Erythrocin) in Ophthalmology with special reference to Trachoma.** *Kumamoto Med. J.* 1954, Aug. 30, v. 7, No. 1, 1-6, 4 figs.

"The antibiotic spectrum of erythromycin was examined from the clinical standpoint of ophthalmology. It is effective in the topical treatment of trachoma, as well as in many bacterial infections of the external eye."

MEZQUITA LÓPEZ, M. La lucha contra el tracoma en la provincia de Almería. [**Control of Trachoma in the Almería Province, Spain**] *Rev. Sanidad e Hig. Pública*. Madrid. 1955, Sept.-Oct., v. 29, Nos. 9/10, 481-512, 8 figs. (3 on pl.). English summary (8 lines).

TROPICAL ULCER

NELSON, G. S. & SEMAMBO, Y. B. **The Treatment of Tropical Ulcers in the West Nile District of Uganda with special reference to an Easily Organised Itinerant Skin-Grafting Team.** *East African Med. J.* 1956, May, v. 33, No. 5, 189-202, 6 figs.

Tropical ulcers still constitute a serious debilitating disease. Although in hospitals a variety of treatments lead to healing of ulcers, it is commonly accepted that satisfactory permanent cure of chronic ulcers is more likely to follow excision and skin-grafting than other methods. The authors present convincing evidence that with the use of penicillin (PAM) before and after excision, this procedure, using spinal anaesthesia, produces

excellent results when carried out by an itinerant team working under dispensary conditions. Acute ulcers heal after penicillin (PAM) without excision. Where an exostosis is present beneath the ulcer it must be chiselled away and the ulcer allowed to granulate for a week before skin-grafting.

[This most encouraging account should be read by all district medical officers. If similar results can be achieved elsewhere a considerable advance will have been made.]

Frederick J. Wright

MISCELLANEOUS DISEASES

CHAUDHURI, R. N., SAHA, T. K., BASU, S. P., MUKHERJEE, A. M. & RAI CHAUDHURI, M. N. **Chronic Splenomegaly.** *Indian J. Med. Res.* 1956, Apr., v. 44, No. 2, 305-23, 1 graph & 22 figs. on 6 pls. [Numerous refs.]

A syndrome known as "Bengal splenomegaly" has long been recognized in Calcutta. Its characteristics are enlargement of the spleen and liver, anaemia, leucopenia, weakness, emaciation and a tendency to develop various complications including thrombocytopenia. A special study of 108 cases has been made and is reported in this paper.

All the patients were Indians; most of them were living on a poor diet of low protein content, came from malarious areas and were village dwellers engaged as agricultural workers or labourers. The majority gave a history of fever suggesting malaria, although 5 came from a non-malarious region and had no history of fever. The disease was of insidious onset and of long duration. Irregular fever was observed after admission to the hospital in 78 of the patients and in 70 there was anaemia, usually of orthochromic or slightly macrocytic type; 16 had oedema of the legs, 18 had ascites, and 8 gave a history of haematemesis or melaena.

Laboratory findings included the demonstration of malaria parasites in 2 cases and of microfilaraemia in 3. The aldehyde test was negative in all. In 20 cases the bone-marrow was studied but in all erythropoiesis was normoblastic.

Spleno-portal venography commonly revealed dilatation and tortuosity of the spleno-portal veins.

Splenectomy was carried out in 12 cases; the principal pathological changes found were thickening of the capsule of the spleen, increase of fibrous tissue in the splenic pulp, congestion of the splenic sinuses and atrophy of the malpighian follicles. Diffuse or focal degenerative change in the liver parenchyma was revealed by biopsy in 22 cases; in 5 there was also fatty infiltration and in 13 the liver was histologically normal.

Medical treatment included administration of haematinics, antimalarials,

adrenaline and cortisone but was without significant effect. The spleen was removed surgically from 12 patients. Two died during the operation, one 3 days later and another a year later. The remaining patients were followed for periods up to 1½ years and in general their weight and blood picture improved. The liver size at first increased, but later diminished and the clinical picture of hepatic cirrhosis developed in 2 cases. Biopsies carried out in 6 of these patients demonstrated progressive liver damage.

It was considered that malaria and malnutrition were important aetiological factors in this disease.

A. W. Woodruff

GELFAND, M. **Tropical Eosinophilia in Rhodesia.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, May, v. 50, No. 3, 283-6.

Tropical eosinophilia has now an established place as a disease of unknown aetiology, often, but not always, responding to arsenic therapy. Characteristically it is associated with dyspnoea and bronchitis and, particularly in early cases, radiographs of the lungs may show mottling. As there are so many other causes of eosinophilia in the tropics, it is difficult to be sure of the diagnosis unless the characteristic features of the disease and a favourable response to arsenic occur. The author, however, considers that in a country where schistosomiasis and other helminthic infections are recognized as common causes of eosinophilia there is a danger of tropical eosinophilia being missed and the patient being wrongly treated. He emphasizes persistent tiredness and debility as important features. He records two illustrative examples of the disease in Europeans in Southern Rhodesia.

[In a disease with such indefinite features errors of diagnosis are almost inevitable. On the one hand it may be erroneously diagnosed in the early stages of schistosomiasis, ankylostomiasis, ascariasis or filariasis before ova or microfilariae are demonstrable; on the other hand these infections may be incorrectly suspected. Complement-fixation tests may assist in the early diagnosis of filariasis.]

Frederick J. Wright

BECKER, B. J. P. & DORFMAN, R. F. **Rhinoscleroma (Scleroma). Report of a Case in South Africa.** *South African Med. J.* 1956, June 23, v. 30, No. 25, 581-4, 6 figs. [13 refs.]

- “ 1. the first case in South Africa of rhinoscleroma is reported.
 - “ 2. A brief review of the literature of the condition is presented.
 - “ 3. Diagnosis in well established cases can be confidently made on histological grounds.”
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PARASITOLOGY: GENERAL

Ricci, M. Il parassitismo intestinale nella popolazione infantile di Lampedusa. [Intestinal Parasitism in the Infant Population of Lampedusa] Rendiconti Istituto Superiore di Sanità. Rome. 1956, v. 19, Pts. 4/5, 398-404.

The English summary appended to the paper is as follows:—

"The author has studied the intestinal parasitism in the infantile population of island of Lampedusa. 256 individuals, of whom 113 males and 143 females, were examined with Graham's scotch cellophane tape method obtaining an infestation index by *E. vermicularis* of 62·11%. Male subjects have shown to be less parasitized than females (53·98% against 68·53%), and children 1-5 years old less parasitized than those 6-12 years old. The stool examination for parasites, carried on on 109 subjects, has led to the identification of the following parasites at the given percentages: *E. coli* (19·27%), *E. nana* (3·67%), *J. bütschlii* (9·17%), *T. intestinalis* (5·50%), *G. intestinalis* (24·77%), *H. nana* (28·44%), *T. trichiura* (8·26%) and *E. vermicularis* (4·59%). Poly-parasitism has been reported in 39·44% of the infested subjects. The various types of parasitic associations and their relative frequency have been pointed out."

DA COSTA, O. R., DE AZEVEDO, M. C. & MAROJA, R. de C. Inquérito parasitológico entre crianças, realizado em seis municípios da zona bragantina, Estado da Pará, em 1950. [Parasitological Survey of Children in Six Localities in the Bragantina Zone, Pará, Brazil in 1956] Rev. Serviço Especial de Saúde Pública. Rio de Janeiro. 1955, Dec., v. 8, No. 1, 231-56, 14 figs. [12 refs.] English summary.

This study preceded the inauguration of a health service in the zone concerned. The authors examined more than 3,000 children and the results of these various examinations and other relevant investigations are shown in 7 tables. There are 14 photographs illustrating the living conditions of the children.

The findings for haemoglobin estimation, spleen and parasite rates and percentages of intestinal parasites are set out for each locality, with separate findings for urban and rural areas. There was considerable variation in many cases, according to the nature of the locality.

Haemoglobin was determined on the Tallqvist scale only and averaged 58·3 per cent. The splenic index varied from 0·3 per cent. in one urban area to 8·4 in another rural area; the average was 4·1 per cent. The parasite index was 1·2 per cent. Hookworm ova were found in 92 per cent. and *Ascaris* in 80 per cent. of the children. *Entamoeba histolytica* occurred in 15 per cent.

Several species of arthropods, including mosquitoes, were found. *Anopheles darlingi*, the main vector of malaria in Brazil, was found in one urban (Igarapé-Açu) and one rural (João Coelho) area.

Two species of planorbids, *Tropicorbis centimetralis* and *Drepanotrema anatum* were found, but no case of schistosomiasis was discovered. The authors note the importance of finding *T. centimetralis* as many immigrants from endemic zones of schistosomiasis reside in the area.

H. J. O'D. Burke-Gaffney

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

HUGHES, J. H. & PORTER, J. E. **Dispersal of Mosquitoes through Transportation, with particular reference to Immature Stages.** *Mosquito News.* 1956, June, v. 16, No. 2, 106-11. [22 refs.]

After a brief review of the carriage of mosquitoes by ships since last century, cases are cited of the introduction of mosquitoes to Pacific islands during the second world war, for example, *Anopheles subpictus indefinitus* and *Aedes albopictus* into Guam, *Aedes aegypti* and *Culex quinquefasciatus* [*C. pipiens fatigans*] into Wake Island and the last-named species on to Kwajalein Atoll. Quite a number of instances occurred during or after the war of mosquitoes arriving in the United States in ships, and even aircraft, in the larval stage in water lying in cargoes of old tyres. At the present time importation of larvae is still observed in water containers aboard ships. The U.S. Public Health Service is alert to these problems. Of 28,000 aircraft from abroad examined in one year 14 per cent. had insects, with a total of 703 mosquitoes. Shipping is also supervised. Without describing procedures, the authors make it clear that use of insecticides on incoming aircraft, and ships if necessary, is an established practice of the public health service.

D. S. Bertram

REID, J. A. **Field Trials of Larvicides for Use against *Culex pipiens fatigans*, with a Note on the Life-Cycle of this Mosquito.** *Ann. Trop. Med. & Parasit.* 1956, June, v. 50, No. 2, 129-36. [18 refs.]

Although DDT emulsion larvicides are effective for *Anopheles maculatus* in Malaya, they failed to control larvae of *Culex pipiens fatigans*, a nuisance biter, breeding in dirty stagnant water. Various larvicides were tried for a year and the results are now reported. DDT proved ineffective at dosages up to 2 lb. per acre, being tried as an emulsion and

as a wettable powder. There is a good deal of evidence that this is due to a high innate tolerance of DDT by this species in Malaya. On the other hand good control was given by 4 oz. per acre of gamma BHC and 3 oz. per acre of dieldrin (= 0·12 p.p.m. of gamma BHC and 0·09 p.p.m. of dieldrin, assuming certain average depths and widths of the ditches used in the tests; a plea is voiced for expressing dosage in p.p.m. in this type of work on small collections of water). Gamma BHC was used as a dispersible powder, dieldrin in emulsion. Oil preparations are contraindicated because they float and do not spread satisfactorily in the scummy breeding places of *C. p. fatigans*. Equivalent results with anti-malarial oils would cost about 15 times as much as BHC or dieldrin treatment. It is firmly pointed out, however, that larval resistance to BHC and dieldrin quickly develops, aquatic development is so rapid as to require applications more frequently than once weekly, and effectiveness lasts only about a day or so (? due to mud sorption). Proper sanitation is the crux of control of *C. p. fatigans*. The adults are no less difficult to control by residual sprays indoors. Whether organophosphorus compounds or some new insecticide can bridge the gap between aspiration and reality is a problem in need of investigation.

The paper concludes with an account of the method of rearing colonies of *C. p. fatigans* in the laboratory. Rearing was in 1-foot-cube cages, blood meals on human or guineapig blood, and larval rearing on water with yeast, Farex and some guineapig dung infusion. There was grass infusion in the oviposition bowls. At approximately 28°C. egg to adult took 7½ to 9½ days but adult activities were slower. Adults seldom fed earlier than a week after emergence, eggs being laid 3 to 7 days later. In 5 to 6 weeks about half or more of the adults bred out and kept on a blood meal weekly plus raisins and water had died. This work was carried on for about 2 years.

D. S. Bertram

MACDONALD, W. W. A Mosquito Survey at Kuala Lumpur Airport with special reference to *Aedes aegypti*. *Med. J. Malaya.* 1956. Mar., v. 10, No. 3, 232-45, 1 fig.

Steps are now being taken to eradicate *Aedes aegypti* in the ports of Malaya, including airports. This is a survey of *A. aegypti* and other mosquitoes within a half-mile radius of Kuala Lumpur airstrip. It is noted that International Sanitary Regulations require eradication of *A. aegypti* only within the airport perimeter, but this allows much scope for undesirable mosquito breeding in the immediate surroundings. The survey was largely of larvae, with some catches of adults near the runway and parking zones. The single runway, 2,000 yards long, is flanked by a variety of terrain and housing including a mixed urban environment, a Chinese cemetery, a rubber plantation, and tin mines. To the west it is fairly hilly and well drained, and on the other sides there is much flat land with pools and ponds common. *A. aegypti* was rare in the airport

premises and RAF quarters and in the Chinese cemetery area which includes numerous houses. A third area, residential and concerned with vegetable growing, is more heavily infested and is becoming increasingly so. In the tin mine area and nearby the percentage of houses with *A. aegypti* ranged from 20 to 43 per cent., and similar results were obtained in a factory area. Areas not infested were open country with scrub and some trees and the rubber estate. Although much of the area is free of *A. aegypti* there seems no reason why it may not spread to many apparently suitable places. Perifocal treatment of all water-containers with DDT is strongly advocated.

Twenty-four other species of mosquito, including 7 anophelines, *Aëdes albopictus*, and *Culex pipiens fatigans* were taken in the area. The two culicines were commonly breeding in containers around houses besides in natural small water collections (*A. albopictus*) and sullage water, septic tanks, and the like (*C. fatigans*).

Catches of adults biting near the runway and terminal buildings included 18 species, of which *C. p. fatigans* comprised 55 per cent. of the total caught; there were no *A. aegypti*, and very few *A. albopictus*.

D. S. Bertram

LEA, A. O., DIMOND, J. B. & DELONG, D. M. **A Chemically Defined Medium for rearing *Aedes aegypti* Larvae.** *J. Econom. Entom.* 1956, June, v. 49, No. 3, 313-15.

This interesting paper describes very fully the preparation of a medium containing a mixture of amino-acids, salts, glucose, cholesterol, ribonucleic acid and vitamins which was successful for rearing *Aëdes aegypti* aseptically, starting with surface-sterilized eggs. Hatching to pupation took 11 to 13 days, and the medium is thought not to be optimal in view of this length of time for larval growth. Optimum quantities of each component are yet to be determined and it may even be that some components may be found unnecessary. Adults emerged successfully provided pupae were transferred (aseptically) to clean water to avoid entanglement at the moment of emergence in the rather viscous medium. The adults, moreover, mated, fed on blood and laid viable eggs. This success developed from efforts to combine the results of earlier investigations on the nutritional requirements of mosquito larvae (TRAGER, *J. Biol. Chem.*, 1948, v. 176, 1211; GOLDBERG & DE MEILLON, *Biochem. J.*, 1948, v. 43, 372, 379 [this *Bulletin*, 1949, v. 46, (408)]).

D. S. Bertram

FLETCHER, O. K., Jr., MAJOR, J. & CABLE, R. **Studies on Fly Breeding in Sanitary Pit Privies in South Georgia.** *Amer. J. Trop. Med. & Hyg.* 1956, May, v. 5, No. 3, 562-72, 3 figs. [22 refs.]

The plan of construction of the model sanitary pit privy in use in Georgia U.S.A. is based on the assumption that house-flies will feed and breed in

the pit unless barriers are erected to exclude them. The inclusion of fly-proofing in the construction of the superstructure of the latrine would add materially to the cost. This latrine incorporates a relatively deep and dark subterranean vault which opens to the surface only through the hole in the seat, which is closed by a wooden flap. Previous incomplete observations have suggested that these units were not important sources of house-flies. The authors set out to determine more precisely the frequency of the conditions under which fly breeding and feeding may occur in these pit privies.

The phases of their investigation were as follows:

- (a) The trapping of insects at the seat opening by means of emergence and entrance traps to determine the frequency of entry and departure of insects;
- (b) collection of larvae from the privy pits to determine the frequency and numbers of *Musca* larvae;
- (c) the planting of large numbers of *Musca domestica* eggs in privy pits to determine whether or not this species would complete its life cycle when introduced into this environment.
- (d) rearing of *Musca domestica* and *Hermetia illucens* larvae together to determine whether or not the presence of numbers of *Hermetia* larvae would affect the development of *Musca* in any way.

A list is given of the kinds of arthropods and their numbers which were caught in the traps in 613 collections. The wide variety included large numbers of *Psychoda* species, *Hermetia illucens*, *Dendrophaonia hilariformis*, *Culex quinquefasciatus* [*fatigans*], Hymenoptera and *Ophyra leucostoma*. On only 56 occasions were *Musca domestica* found, with a total number of 137 as compared for instance with 33,552 of the *Psychoda* species in 72 collections. *Hermetia illucens* (the soldier fly) was present in virtually all of the privies, and together with *Psychoda* species (sewage flies) comprised 87.5 per cent. of the total collections.

Hermetia illucens larvae made up approximately 97 per cent. of the total of 4 million dipterous larvae collected from privies; *Musca domestica* larvae were not found in this collection.

The repeated seeding of selected privies with thousands of *Musca* eggs gave a very small emergence of adult flies suggesting that only a small number of *Musca* eggs which might be oviposited in pit privies ever survive to maturity.

The possibility that the tremendous number of *Hermetia illucens* larvae in most of the privies might interfere with the development of *Musca* larvae led to investigation (d). This was carried out in the laboratory and it was shown that *Musca* developed and emerged in jars which contained *Hermetia* larvae in approximately the same numbers as they did in the controls which contained no *Hermetia* larvae.

Measurements were made at the seat opening in a number of privies of the amount of light reflected up from the pit; the results showed that while illumination varied greatly between the different privies in the series,

it was always quite low irrespective of the amount of sunshine outside the superstructure.

The authors conclude that house-flies neither feed nor breed to any great extent in properly constructed and maintained privies. It is reasonable to assume that the other species of flies that lurk in pit privies are seldom associated with man and are therefore of little or no public health significance. The reason for the absence of *Musca* breeding is two-fold: (a) the relative darkness of the pit is the main factor which repels house-flies; (b) conditions within the pit do not appear to be suitable for the maturation of *Musca* larvae. It is concluded that fly-proofing of properly constructed pit privies is not necessary in Georgia. The method of construction of the sanitary pit privy is well illustrated in the diagram. [It would appear that these conclusions would apply equally well to a properly constructed bored-hole latrine.]

R. Ford Tredre

PEFFLY, R. L. & LABRECQUE, G. C. **Marking and Trapping Studies on Dispersal and Abundance of Egyptian House Flies.** *J. Econom. Entom.* 1956, Apr., v. 49, No. 2, 214-17.

House-flies in a group of villages in the Giza province near Cairo showed resistance to insecticide in some villages and not in others. Consequently a study of dispersal of flies from the villages would show if interbreeding between resistant and non-resistant flies was possible. The flies, mostly *Musca vicina* and *M. sorbens*, were marked by spraying with a 6 per cent. solution of phenolphthalein in acetone and released at one of the villages. The flies were recaptured at baited traps set up in the villages, all of which were within 1½ miles of the release point. Marked flies were detected by immersion in 1 per cent. sodium hydroxide. Of the recaptured flies 81 per cent. were caught within one mile of the release point, and 70 per cent. were caught within the first 3 days after release, although recaptures were obtained up to 16 days after release. The results on dispersal are similar to those recorded by SCHOOF *et al.* [this *Bulletin*, 1953, v. 50, 257] for *M. domestica* in America, and show that flies from different villages are capable of interbreeding. It is suggested that flies may be assisted in dispersal by transport. The population of flies in one village (human population 300 persons) was estimated, from the number of marked flies recaptured on the day following their release, as 750,000 to one million.

B. R. Laurence

HADAWAY, A. B. **Cumulative Effect of Sub-Lethal Doses of Insecticides on Houseflies.** [Correspondence.] *Nature.* 1956, July 21, v. 178, 149-50.

It must be quite usual for insects under natural conditions to have intermittent contact with residual deposits. Some experiments were

done to observe the effects of small non-lethal doses of DDT, gamma BHC, dieldrin and Diazinon applied topically to female house-flies. When the interval between two doses was 24 hours or 48 hours BHC showed no cumulative effect, though such an effect was noted with the other insecticides. When dosages were once daily for 6 consecutive days, it was again with BHC that very little cumulative effect was apparent. Most cumulative effect occurred with Diazinon, and progressively less with dieldrin and DDT. It is concluded that house-flies can eliminate, metabolize or store in harmless condition a proportion of an insecticide absorbed in small quantity, depending on the insecticide. The results support the findings of other workers regarding detoxification of DDT by flies and their metabolism of gamma BHC. The relationship of this to the development of resistance is for future investigation. *D. S. Bertram*

REUTER, S., COHEN, S., MECHOULAM, R., KALUSZYNER, A. & TAHORI, A. S.

On the Mechanisms of DDT-Resistance. *Riv. di Parassit.* Rome.
1956, v. 17, No. 2, 125-7.

This is a brief note with tables on the synergic effects of carbinols on DDT applied topically to a moderately and highly resistant strain of *Musca domestica vicina*. There was no outstanding improvement in kill with any particular combination of toxicant and synergist. It is concluded that the DDT dehydrochlorinase is only partly inhibited by the synergist or that, if this enzyme system is fully inhibited, other biological mechanisms exist enabling the fly to overcome the effect of DDT.

D. S. Bertram

KEIDING, J. **Resistance to Organic Phosphorus Insecticides of the Housefly.** *Science.* 1956, June 29, v. 123, 1173-4.

Organic phosphorus insecticides have been used on Danish farms since 1951, when resistance in *Musca domestica* to chlorinated hydrocarbons was widespread in Denmark. After some illegal use of parathion as residual sprays or in baits, parathion-impregnated gauze strips were approved and widely in use in 1952 and 1953. By 1955, 75 per cent. of farms were using these strips. Diazinon was also used as a residual spray but on a limited scale since 1953. After field trials in 1954 and from May of 1955 one-third of this type of insecticide, Bayer 21/199, was used in certain areas as a residual spray. By July 1955 field reports increased to the effect that fly control was less effective than formerly. Various field and laboratory tests were made to check if the flies were resistant to the organic phosphorus insecticides, flies being collected from different farms and tested against a laboratory strain of DDT-resistant flies as controls. A table gives LD₅₀ results in 24 hours following topical applications. Two DDT-resistant laboratory strains gave these values for LD₅₀ in $\mu\text{gm.}$ per female fly: Bayer 21/199 (0.02-0.06); diazinon (0.03-

0·04), and parathion (0·015–0·023). Results with wild-caught flies from several farms [apparently those caught and not their progeny] were in these ranges: Bayer 21/199 (0·06–11·0); diazinon (0·09–0·17), and parathion (0·03–0·09). The resistance to parathion was, in these tests, usually about 2 to 3 times normal although sometimes up to nearly 5 times; this occurred with at least 2 years' history of residual spraying with parathion. Levels of resistance were higher for the other two insecticides.

The practical significance of these findings is not yet clear. Parathion strips are still satisfactory enough on most farms although the effective contact period for wild flies is about 4 times longer than for laboratory flies. The author is of the opinion that a 10-fold resistance to organic phosphorus insecticides may be sufficient to jeopardize this group of insecticides for fly control. Long-term selection in the laboratory is known to produce strains of fly with 10 to 20 times normal tolerance; this had been thought to be a modest degree of resistance unlikely to have serious practical implications, but the author obviously has anxieties about future trends in fly control with organic phosphorus insecticides.

D. S. Bertram

RAI, L., AFIFI, S. E. D., FRYER, H. C. & ROAN, C. C. **The Effects of Different Temperatures and Piperonyl Butoxide on the Action of Malathion on Susceptible and DDT-Resistant Strains of House Flies.** *J. Econom. Entom.* 1956, June, v. 49, No. 8, 307–10. [11 refs.]

This paper reports with considerable detail treated statistically that piperonyl butoxide and malathion applied topically in acetone solution to *Musca domestica* are antagonistic. By contrast, as will be reported in another paper, piperonyl butoxide has a synergistic effect with Diazinon and with Bayer L 13/59, two other organic phosphorus compounds. Two strains of house-fly were tested, one of them being DDT-resistant and the other susceptible and tests were carried out at four temperatures from 63°F. to 82°F. The results indicate that the antagonistic mechanism is of the same nature in both strains of fly.

D. S. Bertram

KNIPLING, E. F. **Possibilities of Insect Control or Eradication through the Use of Sexually Sterile Males.** *J. Econom. Entom.* 1955, Aug., v. 48, No. 4, 459–62.

BAUMHOVER, A. H., GRAHAM, A. J., BITTER, B. A., HOPKINS, D. E., NEW, W. D., DUDLEY, F. H. & BUSHLAND, R. C. **Screw-Worm Control through Release of Sterilized Flies.** *Ibid.*, 462–6, 1 fig.

LINDQUIST, A. W. **The Use of Gamma Radiation for Control or Eradication of the Screw-Worm.** *Ibid.*, 467–9.

The above 3 papers give a detailed description and discussion of the use of gamma radiation in the control and eradication of insect pests, with particular reference to the experiment in their use against the screw-worm fly in Curacao, a summarized account of which has already been abstracted in this *Bulletin* [1956, v. 53, 817]. The details provided by these 3 papers merit the study of anyone interested in this method of control against insects.

The first consists primarily in a consideration of the underlying principles involved, and lays down the following desiderata for success:—
(i) availability of a method for the mass rearing of the insect involved;
(ii) availability of means for the adequate dispersal of the sterile males;
(iii) that the mating behaviour of the sterile males should not be adversely affected by irradiation; (iv) that the females of the insects to be controlled should not normally mate more than once, or if they do, that the spermatozoa of the irradiated males should be able to compete with those from normal males; (v) that the numbers in which the insect to be controlled normally occurs should be inherently low, or easily reducible by other means to a level that makes it economically feasible to release a dominant population of sterile males over a period sufficient to effect eradication.

The second paper gives a detailed description of the application of the method and its successful use in the island of Curacao, while the third gives a summarized description of this and then discusses in some detail the possibilities of its use against the same fly on the mainland of America.

W. H. Potts

WOITHELET, G. Porocéphalose et radiologie. [**Radiological Diagnosis of Pentastomes**] *Méd. Trop.* Marseilles. 1956. May-June, v. 16, No. 3, 379-85, 10 figs. on 5 pls.

Infections with the larvae and nymphs of *Porocephalus armillatus* occur widely in man in Africa and a review of previous records [no bibliography is given] includes an observation by MOUCHET (1943) who found infection in nearly a quarter of the autopsies done in the Belgian Congo. Between 1949 and 1956, in the Middle Congo, 52,000 X-ray examinations of the chest or abdomen, of which 6,500 concerned the abdomen, were done in Brazzaville on Africans, most of whom came from the Middle Congo for treatment of various conditions, and in 34 males and 9 females X-ray evidence of calcified pentastomes was found. The parasites show as broken rings 6-8 mm. in diameter, 1-2 mm. thick, a total length of 20-25 mm. The largest numbers were found in the abdomen (in some cases several dozen shadows were present) but small numbers were usually found in the chest. They were never found elsewhere.

Ten X-ray pictures are shown.

W. E. Kershaw

GASSER, R. & WYNIGER, R. Beitrag zur Kenntnis der Verbreitung und Bekämpfung von Trombiculiden, unter spezieller Berücksichtigung von *Trombicula autumnalis* Shaw. [Dissemination and Control of **Trombiculid Mites, especially *Trombicula autumnalis***] *Acta Tropica*. 1955, v. 12, No. 4, 308–26, 2 figs. [59 refs.]

The paper opens with an outline of the importance of trombiculid mites as vectors of disease and in trombidiosis, emphasizing the desirability of an acaricide to deal with them. Frequent outbreaks of trombidiosis near Basle stimulated observations on *Trombicula autumnalis* occurring naturally in a private garden 20 × 35 metres in area; distribution of the mites was erratic and concentrated in patches of about one square metre. A compost heap was a principal focus. Larvae could be found throughout the year, but adults or nymphs were never found in soil samples. [Inadequate sampling may be the explanation.]

Larval activity reached a peak on the afternoon of warm sunny days; various factors influencing the annual outbreaks of trombidiosis are discussed.

The symptomatology of trombidiosis is given. Methods of control practised in other parts of the world are discussed, and laboratory and field observations described on trials of Geigy 338 (an emulsion of chlorbenzilate) to kill, and of Kik Geigy as a personal repellent against mite infestation. Both preparations were found useful and are recommended for trial overseas. [The formula of Kik Geigy is obscure: see this *Bulletin*, 1950, v. 47, 278.]

D. S. Bertram

GOULD, D. J. **The Larval Trombiculid Mites of California (Acarina: Trombiculidae).** *Univ. California Publ. Entom.* 1956, v. 11, No. 1, 1–115, 26 pls. [Numerous refs.]

MOHR, C. O. **Comparative Infestations by Ectoparasites of Two Native Rats of Sansapor, New Guinea.** Reprinted from *Amer. Midland Naturalist*. 1956, Apr., v. 55, No. 2, 382–92, 1 fig. [13 refs.]

"Infestations by chiggers (*Trombicula deliensis* Walch, *Schöngastia schüffneri* Walch, *S. vandersandei* Oudemans, *S. mohri* Womersley, *Walchia disparunguis* Oudemans, *Aschochöngastia indica* *rattus* Womersley, *Neoschöngastia oudemansi* Walch), of two species of rats (*Rattus exulans* *manoquarius* Sody and *Rattus ruber* *jobiensis* Rummler) are compared for Sansapor, New Guinea for the dry period, August–December 1944.

"*T. deliensis* was the more numerous on *R. r. jobiensis*. An average of 687 occurred on this rat in the habitat apparently most favorable during the dry season. An average of only 63 was found on *R. e. manoquarius* in the habitat in which it was most heavily infested. The scrub-itch

chiggers *S. schüffneri* and *S. vandersandei* apparently are the more common in habitats occupied by *Rattus ruber*.

16 "Habitat selection by these two species of rats is such that, although there is some overlap of range and population, the combined area covered by the two key hosts is greater than that occupied by either one alone, thus makes available to certain of the chiggers, particularly *T. deliensis*, a greater amount of area and a greater gradient of microclimatic conditions than one species of rat alone could offer. Infestations of *Rattus ruber* are among the highest recorded for rats.

"Related species of rats and a marsupial bandicoot were caught in small numbers in the same habitats. The bandicoot evidently is an additional, essential or neo-essential host in the area.

"Several other species of ectoparasites were taken: *Laelaps nuttalli* Hirst; *Echinolaelaps echnidinus* Berl.; *Hoplopleura oenomydis* Ferris; *Amblyomma* sp.; and *Stivalius* sp."

REID, J. A. **A Small Trial of Insecticidal Resins for Control of Cockroaches.** *Trans. Roy. Soc. Trop. Med. Hyg.* 1956, May, v. 50, No. 3, 227-31.

The principles involved in, and the formulation of, insecticidal resins are concisely stated. Heavy cockroach infestation of rabbit hutches in the laboratory at Kuala Lumpur was tackled by painting 4 wooden rabbit cages with a resin of 2 per cent. gamma BHC and 16 per cent. DDT and two cages with resin of 2 per cent. aldrin and 10 per cent. dieldrin. Rabbits were returned to the cages 2 days later and these and untreated cages with rabbits tended with the usual routine. Cages treated with resin were contrasted with control cages by, at first, weekly then monthly catches of all insects in the darker, nesting section of the cage.

Nauphoeta cinerea, a pale sandy-coloured viviparous cockroach, formed 50 per cent. of the insects caught, a beetle, *Alphitobius diaperinus* [see below] 40 per cent., the remaining 10 per cent. of the catches being another cockroach, other beetles, spiders and moths. Tables summarize the results. Over 11 months 155 insects were found in the treated cages and 68 per cent. were dead; 423 insects, of which only 2 per cent. were dead, were found in the untreated cages and, because of escapes during catching, the number should be higher. Good control was obtained then for about a year, and would probably have gone on longer if the observations had been continued, under conditions of heavy reinfestation. No toxic effects were found in the rabbits. There exists, the author notes, a real risk that laboratory animals protected from pests by resin treatment of their cages would be sufficiently contaminated in their fur with insecticide to be toxic to mosquitoes or other insects fed upon them for experimental work.

This small practical experiment revealed no difference in the efficacy of the two resin-insecticide formulations used.

[In the original paper, the beetle is referred to as *Tribolium destructor*. Dr. Reid has since written to say that this was a misidentification and that the beetle has now been identified as *Alphitobius diaperinus*.]

D. S. Bertram

PETERS, W. Experimentelle Untersuchungen zur Wirkungsweise insekten-abwehrender Mittel (Repellents). [Experimental Studies on the Mode of Action of Insect Repellents] *Ztschr. f. Angewandte Zool.* 1956, No. 1, 1-75, 16 figs. [Numerous refs.]

This rather long paper summarizes information on some of the most effective synthetic repellents and gives some physical data (on their volatility, etc.). In discussions on the physiological basis of repellent action, it is pointed out that this may be due to stimulation either of taste sense or chemical receptors in the insects, or to insecticidal action of the vapour. The experimental section describes tests with dimethyl phthalate, indalone and ethyl hexanediol against *Formica rufa*, *Rhodnius prolixus* and *Calliphora erythrocephala*. These tests provide examples of the 3 types of action mentioned.

The effect of repellents on blood-sucking insects is considered not to be due to mere masking of the attractive colour of the host (as suggested by BACOT and TALBOT [this *Bulletin*, 1919, v. 14, 249]); instead it is suggested that they cause irritation, which induces avoidance, and thus breaks the chain of reflex responses to stimuli leading to a blood meal. It is stated that the effectiveness of repellents at a distance (as opposed to contact action) depends not on the volatility of the compound in question, but on the sensitivity of the chemoreceptors of the insect. The significance of "taste" and "smell" in insect physiology are discussed in relation to theories of ion exchange.

J. R. Busvine

HAWKINS, W. B. & KEARNS, C. W. The Stability of a DDT Suspension. *Bull. Entom. Res.* 1956, July, v. 47, Pt. 2, 197-203, 2 figs.

MISCELLANEOUS PAPERS

BROADBENT, J. L. & REIFF, B. Laboratory Studies on the Detection and Treatment of Yam Poisoning (*Dioscorea dumetorum*). *West African Med. J.* 1956, June, v. 5 (n.s.), No. 2, 76-9, 2 figs.

"(i) The poisonous nature of some *D. dumetorum* yams is associated with the presence of a convulsant alkaloid which is similar to, but probably not identical with dioscorine.

"(ii) Chemical methods are described for the detection of alkaloid containing yams.

"(iii) It is suggested that barbiturate drugs given intramuscularly as required to control convulsions would be a useful form of treatment. Other central nervous system depressants would presumably also be effective."

REPORTS AND SURVEYS

GELFAND, M. **The Nganga of Mashonaland.** I. **The Spiritual Causation of Disease.** *Central African J. of Med.* 1955, May, v. 1, No. 3, 125-6. II. **How the Nganga in Mashonaland qualifies.** *Ibid.*, July, No. 4, 179-81. III. **The Clothes and Equipment of the Nganga.** *Ibid.*, Sept., No. 5, 255-8, 3 figs. IV. **Divination.** *Ibid.*, Nov., No. 6, 304-6. V. **The Types of Nganga.** *Ibid.*, 1956, Jan., v. 2, No. 1, 32-3.

In this series of papers Gelfand displays a very profound knowledge of the details of the practices and qualifications of the medicine men (or women) of Mashonaland, and of the beliefs they hold and foster relating to the causation, cure and prevention of disease and misfortune. The *nganga* [known further north as the *mganga*] is an important person, only less influential than the Chief, and he possesses the special powers and knowledge which enable him to detect and counter the evil influences which, to the African, exist at all times to surround and threaten him. The African is brought up to believe that the cause of disease or disaster is not, as we think, a natural phenomenon or event, but a spirit or a person, and treatment and prevention, therefore, must include measures to detect, and to counteract or placate, these spirits or persons. This is the function of the rituals prescribed by the *nganga* and of the drugs he uses.

The interpretation of misfortune in terms of the intervention of spirits, animated by extremely human motives, chiefly of anger and even touchiness, is of course old and universal, and it is very strong. Doctors trained in the Western style probably in general do not know enough of the thoughts of Africans and their medicine men in this respect, but this series of papers, in which much close observation is presented factually and unemotionally, will help greatly to promote understanding. A question arises whether the Western doctor should ignore the *nganga* or should try gradually to enlist his help by instructing him in the use of a few reliable drugs. This has been attempted elsewhere, and some success has been reported [see WILLIAMS, *Bulletin of Hygiene*, 1956, v. 31, 101].

Charles Wilcocks